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EPTEMBER 1997

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Ironing Out Those Washday Blues

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If You Think The Arc
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features

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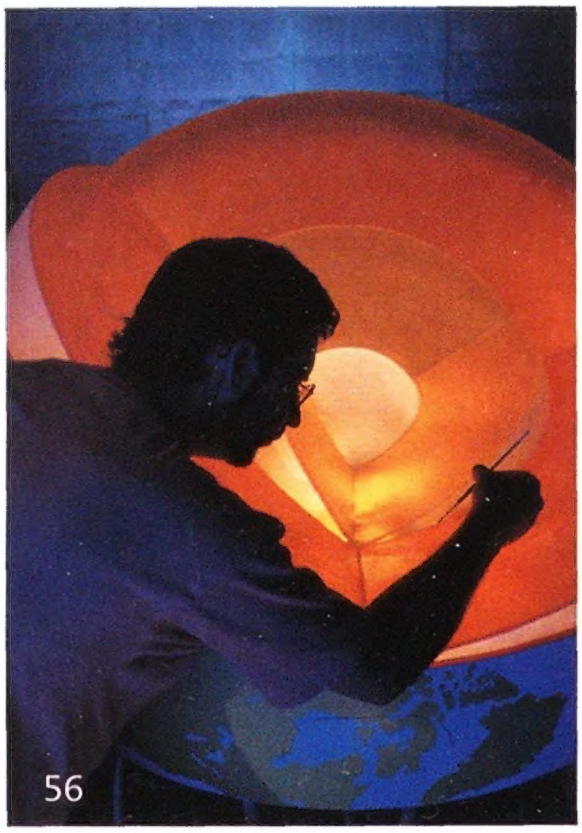

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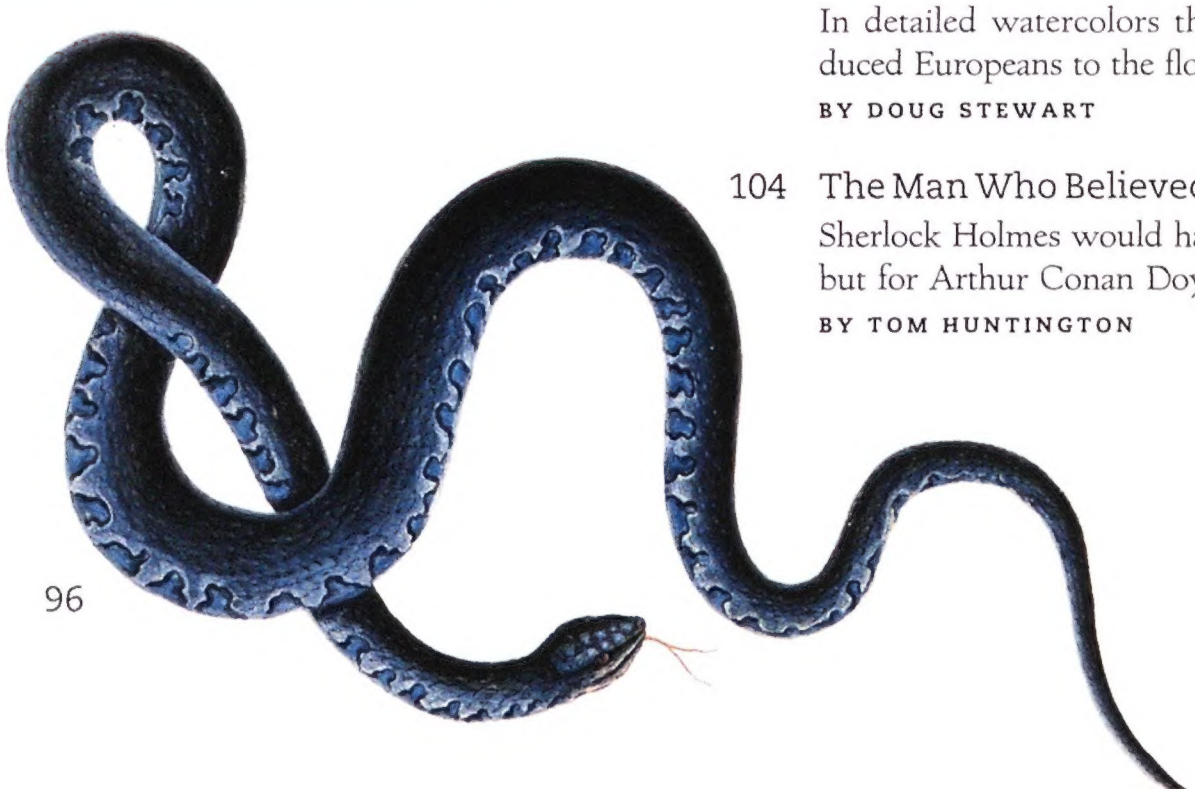

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SMITHSONIAN

departments

SEPTEMBER 1997 ♜ VOLUME 28, NUMBER 6

COVER

Cover Washdays of yesteryear came to a smooth conclusion with irons such as these props from Paramount movies, displayed here by actress Frances Drake in 1933. In her right hand she holds a gas-burning model dating to the late 1800s; in her left, an ancient type of charcoal burner.
WARSHAW COLLECTION, ARCHIVES CENTER, NMAH

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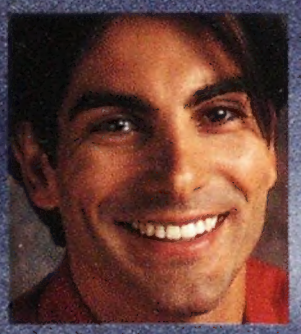

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SMITHSONIAN

PERSPECTIVES

Our New Gem Hall Is a Jewel, Indeed

AN ARTICLE IN THIS MONTH'S SMITHSONIAN CELEBRATES the opening of the Janet Annenberg Hooker Hall of Geology, Gems and Minerals at the National Museum of Natural History, a striking new setting for one of the Smithsonian's most-visited collections. The hall represents the most ambitious exhibition renovation on the Mall in decades. It also reflects the Institution's success in finding ways to support innovative programs, through the generosity of donors and partnerships with the private sector. In fact, the new hall is being created almost entirely with private funds.

Janet Annenberg Hooker's relationship with the Smithsonian is longstanding and goes beyond her gift of $5 million toward building the new hall. Some of the finest jewels in the National Gem Collection were donated by Mrs. Hooker, including the spectacular yellow starburst diamonds that recently dazzled visitors to "America's Smithsonian." The Harry Winston Gallery, the main entrance to the new hall, honors another of the museum's historic patrons, the renowned jeweler who in 1958 presented the Smithsonian with the Hope Diamond. Harry Winston envisioned the Institution assembling a gem collection to rival the royal treasuries of Europe—"crown jewels" that would belong to the American public. Today, the National Gem Collection is one of the things people are sure to remember about a visit to the new hall.

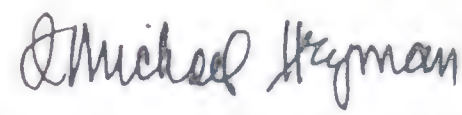
The old hall was memorable, too, for the great number and quality of the gems and minerals on display. Specimens were arranged according to classifications devised in the mid-19th century by mineralogist James Dwight Dana, in conscious imitation of biological taxonomy. Dana grouped stones by their chemical composition and atomic structure, beginning with native elements—gold, copper, silver—and ending with silicates. Most museums continue to exhibit mineral specimens this way—in row upon row, even room upon room, of cases whose order is determined by technical criteria. These traditional halls are wonderfully meaningful to devoted rock hounds. But what about the majority of the six million people who come to the National Museum of Natural History each year—people whose knowledge of the many different sciences spans a wide range?

In creating the new exhibition, the project team wanted visitors to appreciate that ours is a vast collection and includes many rare and beautiful things. But more than that, we'd like to tell people about the important insights the collection offers into the earth's origins and its resources. And we hope to convey what our scientists find fascinating about their fields of research, in the belief that nonscientists will share their excitement at seeing a gem pocket in a vein of rock or understanding how geological forces continue to shape the world.

I don't want to diminish the thrill of discovery people will feel upon visiting the new hall for the first time, but I would like to describe how one of the seven galleries, Minerals and Gems, achieves the museum's goals. "Treasure cases" down the gallery's center aisle display some of the most extraordinary minerals in the collection in order to present key themes, such as what minerals are, where they come from and why they exist in so many forms. Alcoves along the wall contain photographs, videos, interactive computer programs and additional mineral specimens that expand on these subjects. For example, the focus of one treasure case is mineral shapes, illustrated by columnar crystals of smoky-citrine quartz, pyrite cubes, sword-shaped stibnite and a scolecite cluster that looks like a mineral porcupine. In a nearby alcove, visitors can step inside a crystal magnified more than a billion times and observe the cubic arrangement of sodium and chlorine atoms that plays itself out in grains of table salt. At other points of interest, visitors can touch a large quartz crystal and compare the balanced forces of its structure with those that provide strength and stability to bridges, learn why minerals have such fantastic colors, and explore the phenomenon of crystal growth.

The Minerals and Gems Gallery leads to the Mine Gallery, an exhibition that depicts four actual American mines (and which was supported, financially and through gifts of mineral specimens, mining equipment and research access to mines, by the member companies of the National Mining Association). Other galleries are devoted to research on volcanism, plate tectonics and the geology of moon rocks and meteorites—including our latest star, the Mars meteorite.

Overall, I am struck not only by the commitment of scientists throughout the National Museum of Natural History to pursue research that extends the boundaries of their disciplines, but also by their extensive efforts to communicate their work, in all its complexity, to a wide audience.



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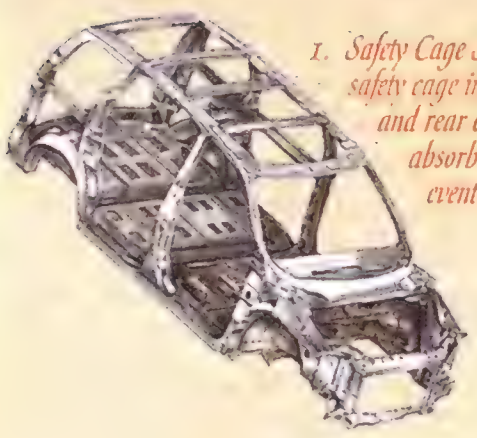

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ERNEST THOMPSON SETON

THANKS, BIL GILBERT. I HAD ALMOST forgotten about every horrifying death of every animal Ernest Thompson Seton made me fall in love with 20 years ago. Silverspot, Lobo and Blanca, the entire Fox family, the Rabbit's mother, the Sheepdog and all the rest. Fine, wild animals don't die peaceful deaths. Although I learned that Seton was not the evil being I had come to believe, I'm still not recommending those books to any child I know.

Kathleen Stevens
San Anselmo, California

ERNEST THOMPSON SETON, AKA BLACK Wolf, became a real person for me through Bil Gilbert's article in July. Seton's animal characters have long lived in my mind and heart because they display human as well as mysterious wild qualities that appeal to both children and adults. Now I am impressed with Seton's artistic abilities. As a child, I took pictures in books for granted.

Barbara Diltz
Rogue River, Oregon

BECAUSE ERNEST THOMPSON SETON ascribed emotions, goals, consciousness, desires and other supposedly unique human traits to animals, he was called a "nature faker." Scientists are supposed to be scientific, and anthropomorphism is considered too softheaded or softhearted. Yet many veterinarians employ anthropomorphism when evaluating their patients' well-being and behavioral problems.

Kenneth B. Haas, D.V.M.
Kalamazoo, Michigan

TOWERS

THANK YOU FOR JAMES R. CHILES' article about the largely unrecognized heroes of broadcasting and radio communications—the tower crews of this country. I've hired tower crews to repair damages resulting from violent winter weather and summer lightning strikes, among other things. I've often pondered the reason these guys are in the business. One clue came last winter, after-hours on a lousy January day, when the tower company owner came out to my radio station by himself to

Layne Kennedy shot towerhand Gerry Lane climbing high above Ropesville, Texas.

grapple with an emergency. When asked where his crew was, he said he'd given them a well-deserved weekend off and added that he wasn't about to ask them to do anything he wouldn't tackle himself. Who wouldn't want to work for a boss like that?

Bill Kleronomos, Chief Engineer
KBCO FM & AM
Boulder, Colorado

I AM DISMAYED THAT YOUR FINE MAGazine has seen fit to glamorize the construction of tall broadcast towers. These obscene structures are migratory bird-killers in disguise. The well-being of these creatures, whose primary attributes are beauty and song, is far more important to us than the merciless towers that kill them as they fly their ancient migration routes.

Carl Haussman
Lansing, Michigan

MONET

I ENJOYED HELEN DUDAR'S ARTICLE ON Claude Monet but was amused by her politically correct tobacco-bashing when she wrote that photographs always show the artist "with a cigarette in his hand or mouth, an addiction that would ultimately, fatally, ravage his lungs." The average life expectancy of a European born in 1840 was about 50 years, yet Monet lived to be 86 (1840-1926). No matter how long you survive, those cigarettes will get you in the end, won't they?

Josiah C. Manning
Aurora, Missouri

BIX BEIDERBECKE

FRED TURNER'S PIECE ON BIX BEIDERbecke was greatly enjoyed. I wrote a lot about the Big Bands, and there were many tales told about Bix. Once I asked Louis Armstrong what Bix really died of, and the trumpeter said, "What, specifically, I don't know. I think he died of everything."

Barney Oldfield
Los Angeles, California

REDESIGN

In our July issue, we asked our readers to comment on our redesign, and comment you did with a flood of letters, both pro and con (and a lot of mixed reviews from those who liked certain elements of the design and disliked others). Needless to say, the response has given the editors plenty of food for thought. Even more heartening than the many favorable reactions was that so many readers not only took the time and trouble to write us, but also clearly put a lot of thought and effort into their comments. We don't have room to print all the letters, but starting on page 14 are some brief excerpts that suggest the range of responses.

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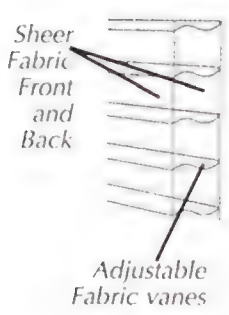

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KUDOS TO DON MORRIS FOR THE delightful new magazine design. The elegant old lady is now a flirtatious young charmer.

Bill Eastham
Albuquerque, New Mexico

DOES THE MONA LISA NEED A NEW hairdo? Your reasons for the change were a little disappointing and slightly insulting. I prefer to discern the flavor of an individual story by trusting the writer, photographer and illustrator to do their jobs. After the Zen-like simplicity of the old design, this one feels cluttered and claustrophobic. Bradbury Thompson is a tough act to follow.

Anthony S. Picco
New York, New York

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James F. Lane
Friday Harbor, Washington

I LIKE IT, FOR THE MOST PART. THE cutlines are much easier for the eye to separate from the body text. The logo looks better, stretched all the way across the front of the book. And I like the variation in the photo frames, the gutter jumps, the text wraps—you wild and crazy guys. I'm not nuts about the department boxes—they look like Webpage icons. I kept pointing at them with my finger and making clicking noises with my tongue.

Bill Cannon
Chapel Hill, North Carolina

I HAVE ONE QUIBBLE. ADDING AN OUTline to the elegant SMITHSONIAN logo is like putting tail fins on an automobile: momentarily stylish but ultimately unnecessary.

Paul Friese
Amagansett, New York

ONLY ONE SOUR NOTE: YOU MOVED THE page numbers from the outside margins to the middle. Try thumbing quickly to a desired page!

Michael W. Gaynor
Bloomsburg, Pennsylvania

THE LAYOUT CHANGES AND YOUR choice of fonts have improved the look of the magazine, except for the typeface used for the captions. Also, I have a problem with your butting pictures together, such as Galen Rowell's horned puffin against his macaroni penguin and, gad, the Monets that you crammed together.

Christine Peterson
Bremerton, Washington

AS A GENTLEMAN WHO IS 94, I AM surprised to find myself writing to a magazine for the first time. I had scarcely opened the July issue when I realized something good had happened. Very good. It is attractive and reader-friendly.

Kier M. Boyd
Pittsburgh, Pennsylvania

YOU HAVE MADE THE MAGAZINE DIFFIcult for your senior citizens to read. The text is too faint, and the table of contents no longer has boldface type to set off the story titles and page numbers. On the plus side, the title pages of "Black Wolf" and "The Old North Trail" with their colored borders were fine.

Jean Clark-Graney
Hancock, New Hampshire

THE INSERTION OF COPY IN CLAUDE Monet's *Bordighera* is distracting and ruins any pleasure in looking at the picture. The label-like headline for "The Old North Trail" destroys Ted Wood's fine photograph. The splashy spread that begins the "Black Wolf" story could be a vodka ad.

Eugene Swan
Spruce Head, Maine

ALTHOUGH GORGEOUS FROM A DISTance, the new poster-like style is a disaster. Increased amounts of negative space, extra pulled quotes, large-type lead-ins, colorful borders and icons abound and interrupt the text.

Laura Brown
Lake Oswego, Oregon

DON MORRIS HAS DONE A TREMENdous job in retaining the flavor of the original design. The best part of the overhaul is the typography treatment, coordinating it to the articles' subjects.

Melvin T. Bishop
West Hartford, Connecticut

GOOD PHOTOGRAPHS OR ILLUSTRAtions are all the enticement we really need to start reading; good writing does not need flavor enhancement.

Carol Ann Sheffield
Point Richmond, California

THE DESIGN IS FAR TOO BUSY. TOO much effort was placed on trying to be splashy than on advancing the writers' words. Design ought to serve function, not vice versa. Leave the visual flash to those with less to say.

Robert E. Weir
Northampton, Massachusetts

OVERALL, THE NEW LOOK IS QUITE nicely designed, but the black box with reversed page numbers is gratuitous and distracting.

Andy Mitchell
Amherst, Massachusetts

YOUR NEW LOOK IS REFRESHING AND welcome except for the annoying department icon for *Editor's Note*. The pen shown is a fountain pen, but the ink bottle is drawing ink. Drawing ink inside a fountain pen would quickly dry and clog the feed.

Arvin Chaikin
Bellingham, Washington

Letters for consideration in this column must include your full name, daytime telephone number and postal address. Letters may be edited for clarity and length. Post mail to Letters Editor, SMITHSONIAN, 900 Jefferson Drive, MRC 406, Washington, DC 20560 or transmit it to edletters@aol.com.

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Here, Birds Are Unafraid

GALÁPAGOS SEABIRDS TOLERATE HUMAN SPECTATORS, AND CRABS IN PANAMA IGNORE CARS (BUT HIDE FROM TRUCKS)

BY MICHAEL H. ROBINSON

A female blue-footed booby performs "wing flailing," bringing her wings down and forward, and moving toward the recipient of this behavior, a rival (or possibly her partner) who is about where the camera seems to be.

I RECENTLY RETURNED FROM A Smithsonian tour of the Galápagos Islands. This was my first visit to the Mecca of biologists. Now, I am not easily impressed by wonders of natural history; in the course of nearly 20 years as a tropical biologist, I have seen a lot. In the past, when I was based at the Smithsonian's jewel-in-the-crown Tropical Research Institute, in Panama, I worked in more than 20 different tropical countries, and mainly in rain forests. What was outstanding about the Galápagos was the "tameness" of the animals. On island after island you can walk right up to animals that would, in all other circumstances, be expected to flee.

As a consequence of this tameness, one of the delights of my visit was to stand close to a pair of blue-footed boobies and watch the high-stepping choreography of the pair-bonding process. When a male returns to the nest site, he doesn't just alight. He gives a performance directed at his mate and potentially rival males. He lands *flamboyantly*: wings outstretched, primaries fanned out to the maximum area, tips curled upward—a toreador's cloak disproportionately magnified. Add to this the almost vertical body, with tail extended in line, and glorious blue legs and feet. These last have their webs fully extended, and whichever one is up is held against the pale belly, maximizing the visual impact. The males may or may not do this while facing females, and may even show such behavior when females are absent. It is the male's way of announcing that this is *his* territory.

What follows the landing appears comical, almost Chaplinesque, but its message is vital. The male may walk around using exaggerated, deliberate-looking leg movements, displaying his bright-blue legs and feet. Actually his parade is closer to the pick 'em up and put 'em down gait of beflippered scuba divers. Bird guides describe the color of the feet as bright blue, but that is totally inadequate. I remember a once-fashionable color called shocking pink . . . this is shocking blue. The bill is part of the show, too. As the walkabout proceeds, first the bill is held against the chest, pelican-style, then, as if overcome by shyness, the male faces away from the female with bill raised

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If we were deer, we'd need front-view mirrors to drive.

up, and finally may turn toward the female, spread his wings and "sky-point." The head is thrown back, the bill is pointed straight up and the wings are rotated, so that the top sides of the wings are presented to the female.

All of this and more, including whistling and bill-touching, is part of the ritual. The female is not a passive "suitee." She may parade around; jab at the male, dueling style; face away; rattle her wings; and sky-point, too. Eventually, there is symbolic nest building and mating, and then two, sometimes three, eggs are laid. All this can be seen close-up, without a blind, without recourse to binoculars. The birds are not afraid. As one watches the boobies, they in turn regard the human observer from time to time with their beautiful golden eyes.

Boobies' eyes face forward for a simple reason: depth perception. Nonpredators have wide-angle eyes set on the sides of their heads to watch for enemies. We humans have stereovision, and a relatively narrow field of view. That's why we need rear- and side-view mirrors in our cars. If we were deer, we'd need front-view mirrors to drive.

Boobies need accurate depth perception because of their fishing technique. They can spot fish from 100 feet and more above the water, and then they fold their wings and drop like stones onto their prey. A squadron—sorry, flock—of boobies may fly in and almost simultaneously drop onto a target area. Another trip highlight was to see feeding frenzies involving fish, birds and whales. These occur when birds find large schools of "bait fish." Predators quickly assemble. I saw feeding frenzies at schools of anchovies, with three species of boobies playing the dive-bomber's role and frigatebirds flying in as low-level attackers, skimming the water and scooping up fish with their hooked bills. Sharks gathered around the melee, while large tuna flashed through the scattering schools. Clouds of anchovy scales slowly fell like confetti around the massacre. As a grand finale a huge Bryde's whale breached nearby, exhaling its breath with a watery sigh. It was netting hundreds of anchovies in its huge whalebone jaw-filters. Great theater!

A female, left, goes "bill-up, face-away" while parading. These ritualized activities precede movement. The male is "sky-pointing," a sexual advertisement.

The Galápagos tameness has—presumably—evolved in the absence of substantial predators. It is found in birds of other oceanic islands. The distance that an animal normally puts between itself and a predator is called flight distance. This equates to the distance a predator can approach before the animal flees.

When I was studying the defensive behavior of crabs in Panama, I found an interesting variation in the flight responses of mangrove crabs. Those that I watched lived close to a major road. They did not flee down into their burrows in response to passenger cars but did retreat when large trucks went by. Trucks were rarer than cars, in a ratio of about 1 to 40. Interestingly, the escape response to trucks persists in the absence of real danger. No crab has ever been attacked by a truck when standing outside its burrow. It is appropriate, however, that escape responses to large moving objects should be difficult to extinguish. But, because hundreds of cars passed by throughout the day, running for shelter every time a car passed wouldn't be energy efficient. In the absence of attacks, many organisms learn to ignore stimuli that are constant or occur frequently. This is a behavioral process called habituation. It occurs widely in the animal kingdom. Scarecrows cease to scare. Plastic owls on buildings finally fail to exclude roosting starlings, and recordings of their alarm calls eventually fail to rid airports of feeding seagulls.

The history of oceanic islands is one of human destruction. Animals and plants have been ravaged by shortsighted exploitation for food, fashion and fancy. The graveyard of vanished species is ominously impressive, with the dodo perhaps the best known. Birds were dominant on many of the islands because flying creatures were most likely to reach islands distant from populating mainlands. Mammals usually came with the human colonists. This happened both intentionally and accidentally. Dogs, pigs and goats were introduced as food sources. Rats made it ashore because they are prime members of the mammalian Explorer's Club and stowaways on vessels of every description.

So what about the future of the Galápagos fauna? The tameness raises some interesting questions. It is not the tameness of habituation, as the earliest visitors noted, since there have been no repeated false alarms from intruding humans. Without contact with major mammalian danger, has fear been bred out? Are humans specifically excluded from the dangerous category? We can't afford to experiment in search of the answers. Neither can we afford any more mistakes in allowing dangerous animals to settle in the enchanted islands. After seeing the glory of it all, I hope we can act in time to save, for future curious naturalists and all who possess a sense of wonder, the essence of the Galápagos magic.

Michael H. Robinson, director of the National Zoological Park, is an animal behaviorist.

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AROUND THE MALL & BEYOND

In Praise of Shadows

ARTFULLY BALANCING THEM IS JUST ONE OF THE TRICKY TASKS FACED BY DESIGNERS OF MUSEUM LIGHTING

BY BRUCE HATHAWAY

FOR DECADES I ALLOWED MYSELF to be dismissed as a "photophobe"—always the one to pull the shade, put in a 40-watt bulb, disconnect glaring fluorescent tubes overhead. I had to apologize continually for my cave-like office: "After growing up in sunny Colorado I deserve a break from brightness." Then came an epiphany. John Zelenik, head of exhibition design and production at the Smithsonian's Sackler and Freer galleries, and Richard Skinner, head of lighting design there, began collaborating. And, I came upon a little book, *In Praise of Shadows*, by Japanese novelist Jun'ichiro Tanizaki. A lightbulb clicked—in this case, off: I'm not a photophobe. I'm a "shadowphile."

Tanizaki, born in 1886, laments the "senseless and extravagant use" of electric lights, and their "blinding blaze." Excessive lighting, he observes, has robbed us of the beauty of spacious patterns of shadows, heavy shadows against light shadows, the "soft fragile beauty of . . . feeble light." In architecture, theater, cuisine, even feminine beauty, he proclaims, we have lost the "delicate glow of fading rays."

For years I have indulged my shadowphilia at John and Richard's exhibitions; they are a soothing respite from standard office lighting (specced so everybody can read the finest print in the deepest corner), which flattens both color and depth perception. John is known for pushing gallery wall colors away from the usual taupes and grays and toward richer hues that bring out the highlights of the art and add liveliness to the gallery spaces. Again and again, Richard has shown himself to be a lighting-design genie.

I well remember entering the final room of "Noble Path," a 1989-1990 Sackler show that traced the spread of Buddhism through Asia. There in exhibit cases were small bronze Tibetan statues, including a wild, multi-armed, multiheaded demon figure casting eerie shadows as if magically illuminated from directly below. I looked carefully all around the floor of the case for a light source, but it was completely black and opaque. I looked again at the shadows—the light had to be coming from under that floor. "John told me he wanted to do something different here," Richard explained. "He wanted that last room to have a mysterious feeling. I decided to try a new film material from the 3M Company, acrylic sheets with microscopic louvers embedded in them. They let light pass through the film but block the view of its source. The up-lighting effect wasn't just a gimmicky theatrical trick, though. These centuries-old figures were usually illuminated by a yak-butter lamp positioned at their base, so similar shadows would occur."

Richard often has to make his fixtures disappear. To focus beams on the centerpiece painting in the Freer's dimly lit Peacock Room, he hid ten tips of fiber-optic cable in two of the ornate, crystal-pendant ceiling lamps; the cables stretch 25 feet across the inside of the ceiling to a bright halide light source.

As we talk, I realize that Richard is one of these nontype types. "I was mechanical as a child, always taking motors and stuff apart. Then in junior high I got very interested in art." He has a diploma in fine arts and has also studied electrical and mechanical engineering. His job at the Smithsonian and trips to places like Beijing, Delhi and Madras as a consultant have led to even

Richard Skinner focused seven ceiling spots to illumine this millennium-old Sri Lankan bodhisattva.

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broader interests. In addition to being a member of the Illuminating Engineering Society of America, he is a yoga instructor and a serious student of Indian music, learning to play the sitar.

He laughs when I ask him if he's read *In Praise of Shadows*. "Yes, sure. I laugh because I spend so much of my time trying to control shadows—particularly ones that obscure or distract attention from art objects. I'm always thinking about creating a balance with light and shadow—reducing what we designers call the visual noise of an installation. I try to arrange shadows symmetrically, in a pleasing composition that complements the artwork."

Temple guardians stand out behind Skinner (left) and John Zelenik, yet the light fixtures are discreetly recessed.

Richard tells me that with the development of track lighting around 30 years ago and the evolution of low-voltage and other efficient bulbs and, more recently, fiber optics, lighting designers have a rich palette to work from. Initially all the can-shaped track fixtures look the same to me, just turned at various angles. Then Richard begins pointing to a different screen here, a little shield and a heavier diffuser there. "The big differences are inside. There are dozens of low-voltage bulbs to choose from, with subtle variations in color, and depending on how narrowly you want the beam focused, and how bright you want the surface being illuminated to appear."

John Zelenik is now at the National Museum of American Art. He and NMAA's chief lighting designer, Scott Rosenfeld, show me Louise Nevelson's 1982 *Sky Cathedral*, a large, wall-mounted sculptural work in which wooden objects of myriad shapes create a hovering, high-relief warren of recesses and jutting edges. Ideal for shadows, yet the entire work is painted flat black. Scott explains how he aimed blue lights from a low angle into the shadow areas. Standard incandescent lamps, which appear amber in contrast to the blue filters, shine down from a steeper angle to light the upward-facing edges. As a result, the shadows look deeper and the highlighted edges pop out. John notes that a similar approach to enhancing the appearance of volume is used in stage lighting. "There, blue and amber, complementary colors, are used on opposite sides of the stage. What we're doing here is much less dramatic, but it does help bring out the form of the work."

John then tells me about choosing wall colors. "The goal, of course, is to have the main energy coming from inside the artwork. But first, I want visitors to enjoy the space as a whole. Artful lighting can make all the difference. The more patient the lighting designer, the better the result." Richard later explains that lighting designers do have to work carefully, but also very quickly. "We're usually the last ones in during those pressured few hours right before the show opens."

Scott then takes me to see Larry Fuente's 1988 *Game Fish*, at NMAA's Renwick Gallery. It is a mounted sailfish trophy decorated with a few thousand pop culture tchotchkes, many related to games, including statuettes of Gumby, Superman, Cap'n Crunch, Popeye and just about everybody else you can think of.

"I wanted to make certain that visitors could pick out each and every object, so I used low-voltage bulbs that produce small, precise beams. I aimed these spots from a low angle. Another bank of spots was aimed at a steep angle above to cast highlights and shadows. The final touch was a single spot from the side of the work to pick out the false teeth in the fish's mouth.

"As always, however, I had to keep the rest of the room in mind. I see the exhibition as a sort of three-dimensional drawing, where the careful balance of light and shadow produces a dynamic landscape." Is Scott a fellow shadowphile? I went back and carefully inspected the floor, exhibit case sides, base edges, label areas, corners, door frames. All shadows carefully placed. Not a single "noisy" one.

Finally, I see David Hockney's 1995-96 painting *Snails Space*. Under his direction, it has been dramatically illumined by a nine-minute computerized sequence of highly sophisticated, color-changing fixtures created by Vari-Lite, a Dallas-based stage-lighting company, which of course sees a bright future for such daring experiments in museums. OK by me, as long as they don't get so flashy that they clash with the serenity of shadows. But even if they do, Richard says not to worry. "For a person like you, aging is a blessing. Starting around age 40, everything looks progressively dimmer."

Bruce Hathaway is the editor of Around the Mall & Beyond.

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SMITHSONIAN HIGHLIGHTS

"FAMILY. I STARTED MINE LATE. I WAS 45 when I married for the first time. . . . I had Lydia, my first child, at 48. My intention with this project is to document this family, but I must admit already to focusing more on Lydia than on the rest." —*Tony Mendoza*

Seven of Cuban-American photographer Tony Mendoza's autobiographical images, including *Halloween: Lydia, Who Had Just Turned Three, Wanted to Be a Bride* (above), are currently featured in "American Voices: Latino Photographers in the United States." On view through September 28 in the Ripley Center's International Gallery, the groundbreaking show represents a unique cross-cultural collaboration between four Latino curators and 39 artists from the three oldest and largest Spanish-language cultures in the United States—Mexican-American, Puerto Rican and Cuban-American. Originally organized by FotoFest, Inc., of Houston, Texas, the exhibition showcases 210 works that draw on 400 years of cultural history—from the Afro-Caribbean experience of slavery and the California farmworkers' movement to Puerto Rican life in New York City today. "Individually and collectively, these artists confront issues of history, family, memory, diaspora and identity," says Wendy Watriss, FotoFest's artistic director. Together, they reflect the diversity and depth of creative expression among contemporary Latino artists working in the United States. The show will begin a two-year national tour, coordinated by the Smithsonian Institution Traveling Exhibition Service, in 1998. —*Diane M. Bolz*

Special September Exhibitions, Events

INTERNATIONAL GALLERY, S. DILLON RIPLEY CENTER

American Voices: Latino Photographers in the United States (through September 28) Photographs and artworks from the 1930s to the 1990s by top Latino artists around the country. See page 24.

FREER GALLERY OF ART

Japanese Art in the Meiji Era (1868-1912) (opens September 20) Show explores the Freer's holdings of paintings, drawings, ceramics, lacquer and cloisonné from the Meiji Era.

Chinese Gardens in the Painter's Imagination (through February 1, 1998) Paintings from the 12th to the 19th century depict real and imaginary gardens.

ARTHUR M. SACKLER GALLERY

The Jewel and the Rose: Art for Shah-Jahan (through January 25, 1998) Paintings, textiles and objects illustrate the splendor of Indian artistic expression during the reign of the builder of the Taj Mahal.

Khmer Ceramics (runs indefinitely) Rare glazed vessels from the 9th-to-14th-century Khmer empire.

NATIONAL MUSEUM OF AFRICAN ART

Gifts to the National Collection of African Art (September 16-March 4, 1998) Exhibition featuring recent gifts honors the collection-building legacy of former director Sylvia H. Williams.

Treasures from Tervuren: Selections from the Belgian Royal Museum for Central Africa (through October 19) Masterpieces from the world's greatest collection of Central African art.

HIRSHHORN MUSEUM & SCULPTURE GARDEN

Directions—Louise Lawler: "Monochrome" (through October 19) First solo show in Washington for the New York-based conceptual artist.

The Collection in Context: Raymond Duchamp-Villon's "The Horse" (through November 30) Display explores how the work of this French sculptor (1876-1918) echoed his response to, and belief in, the machine.

NATIONAL AIR AND SPACE MUSEUM

Women and Flight (through September 12) Images of 37 contemporary women aviators by NASM photographer Carolyn J. Russo.

Space Race New permanent exhibition traces the competition in space between the United States and the former Soviet Union back to its origins in the 1950s.

NATIONAL MUSEUM OF AMERICAN HISTORY

From Frying Pan to Flying V: The Rise of the Electric Guitar (through October 24) Exhibition takes a look at the history of the electric guitar.

American Encounters Permanent display focuses on the American Indian, Hispanic and Anglo-American cultures of New Mexico's Upper Rio Grande Valley.

NATIONAL POSTAL MUSEUM
[NEAR UNION STATION ON CAPITOL HILL]

What's in the Mail for You! Permanent exhibition offers an innovative look at the direct-mail industry.

NATIONAL MUSEUM OF NATURAL HISTORY

Janet Annenberg Hooker Hall of Geology, Gems and Minerals (opens at noon, September 20) New gallery showcases the National Gem Collection and takes visitors from the depths of a copper mine to the far reaches of the Solar System. See page 56.

Exploring Marine Ecosystems Newly renovated permanent installation explores two of our oceans' many ecosystems: a tropical coral reef and a temperate rocky shore reef.

NATIONAL ZOOLOGICAL PARK

What's New at the Zoo? One Sumatran tiger, 2 golden-lion tamarins, 4 inland bearded dragons, 5 scarlet ibis, 6 pygmy marmosets, 29 prairie dogs and a brand-new, 127-pound, baby giraffe.

NATIONAL PORTRAIT GALLERY

Mathew Brady's Portraits: Images as History, Photography as Art (September 26-January 4, 1998) More than 100 images represent all facets of Brady's work.

Edith Wharton's World: Portraits of Peo-

Planning a Smithsonian Visit?

Receive a free Associates' planning packet. Write Smithsonian Information, Smithsonian Institution, Washington, D.C. 20560, or call 202-357-2700 (voice) or 202-357-1729 (TTY), 9 A.M. - 5 P.M., Monday-Friday; 10 A.M. - 4 P.M., Saturday-Sunday. *Note:* Parking near the Smithsonian is limited. The Metrorail subway is convenient to all museums (details in packet).

Begin your visit at the Smithsonian Information Center's Associates' Reception Desk—open 9 A.M. - 4 P.M. daily—in the Castle. Special materials await you there. The Court dining room and all other eating facilities in the National Museum of Natural History are closed. Associates may receive a discount at the National Air and Space Museum's Wright Place restaurant, open 11:30 A.M. - 3 P.M. daily.

Smithsonian museums are generally open 10 A.M. - 5:30 P.M. daily, except December 25. Hours at the National Zoo are 10 A.M. - 4:30 P.M. daily for buildings, 6 A.M. - 6 P.M. for grounds.

SMITHSONIAN WEBSITE

The Smithsonian home page on the World Wide Web (www.si.edu) offers on-line information about exhibitions, collections, events and products.

ple and Places (September 26-January 25, 1998) Paintings, miniatures and photographs of Wharton and friends, along with first editions, memorabilia.

NATIONAL MUSEUM OF AMERICAN ART

The Paintings of Charles Burchfield (September 26-January 25, 1998) Works by the famous watercolorist.
Nam June Paik's "Megatron/Matrix" (through November 30) Installation by pioneer video artist Paik features 215 TV monitors with synchronized visuals and accompanying audio.
The Bard Brothers: Painting America Under Steam and Sail (through September 28) Marine scenes, from the 1820s to the 1890s, by James and John Bard.

RENWICK GALLERY

Michael Lucero: Sculpture (September 12-January 4, 1998) Show presents two decades of the artist's glazed ceramic, bronze and mixed-media sculptures.
Reinstallation of the Permanent Collection Works by nationally prominent artists in a variety of craft media.

ARTS AND INDUSTRIES BUILDING

Caribbean Visions: Contemporary Painting and Sculpture (through October 4) Some 100 works by 56 painters and sculptors illustrate creativity in the Caribbean region during the past 50 years.
Stories of the People (through January 25, 1998) Artifacts drawn from the permanent collection of the National Museum of the American Indian.
Discovery Theater Live theater for young audiences. For information and reservations, call 202-357-1500 (voice or TTY) weekdays, 9 A.M. - 4 P.M.

THE CASTLE—INFORMATION CENTER

Smithson's Gift Permanent display tells the story of the British scientist whose bequest founded the Smithsonian.

ANACOSTIA MUSEUM

Museum Renovation The museum is closed until the late fall of 1997.

James Bard's 1858 painting of the steamboat *P. Crary* offering a line to the sloop *Turkey Glen* is in the "Bard Brothers" show at the National Museum of American Art.

HEYE CENTER, NATIONAL MUSEUM OF THE AMERICAN INDIAN
[NEW YORK CITY]

All Roads Are Good: Native Voices on Life and Culture (runs indefinitely) Inaugural show features more than 300 objects that illustrate the diversity and continuity of Native cultures.

COOPER-HEWITT, NATIONAL DESIGN MUSEUM
[NEW YORK CITY]

Design for Life: A Centennial Celebration (September 30-January 4) Exhibition examines how design shapes the activities and patterns of daily living, architecture and environmental space, and the communication of ideas.

EXHIBITION CATALOGS

Catalogs available currently include:
The National Gem Collection ($39.95/$24.95 paper)
Mathew Brady and the National Image of History ($39.95 cloth)
The Paintings of Charles Burchfield ($60 cloth)
Caribbean Visions: Contemporary Painting and Sculpture ($24.95 paper)
Stories of the People ($18.95 cloth)
The Bard Brothers: Painting America Under Steam and Sail ($35 cloth)
Send check or money order to Smithsonian Museum Shops, P.O. Box 1140, Newington, Virginia 22122. Include 15 percent of purchase for postage, handling (minimum, $4.50).

THE SMITHSONIAN ASSOCIATES, RESIDENT PROGRAM

To become a member, or for fee and ticket information, call 202-357-3030. September events include:
American Voices: The Work of Contemporary Latino Artists (September 25; 6 P.M.) Free program brings specialists in Latino art together with contemporary Latino artists.
The World of the Druids (September 22; 6 P.M.) Slide lecture by Celtic specialist Miranda Green.

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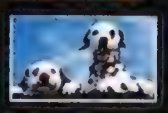

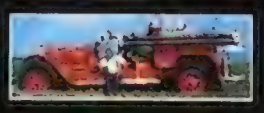

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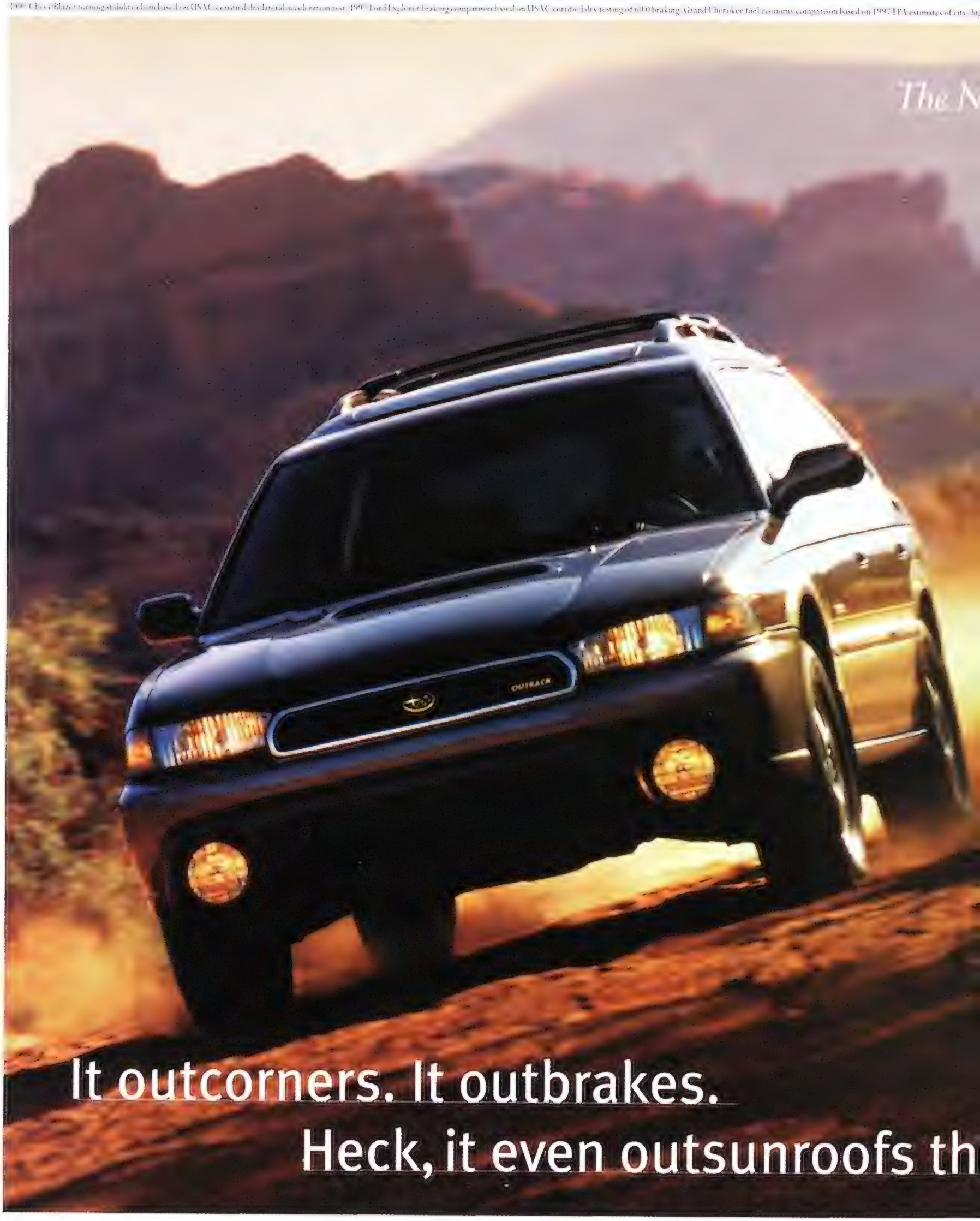

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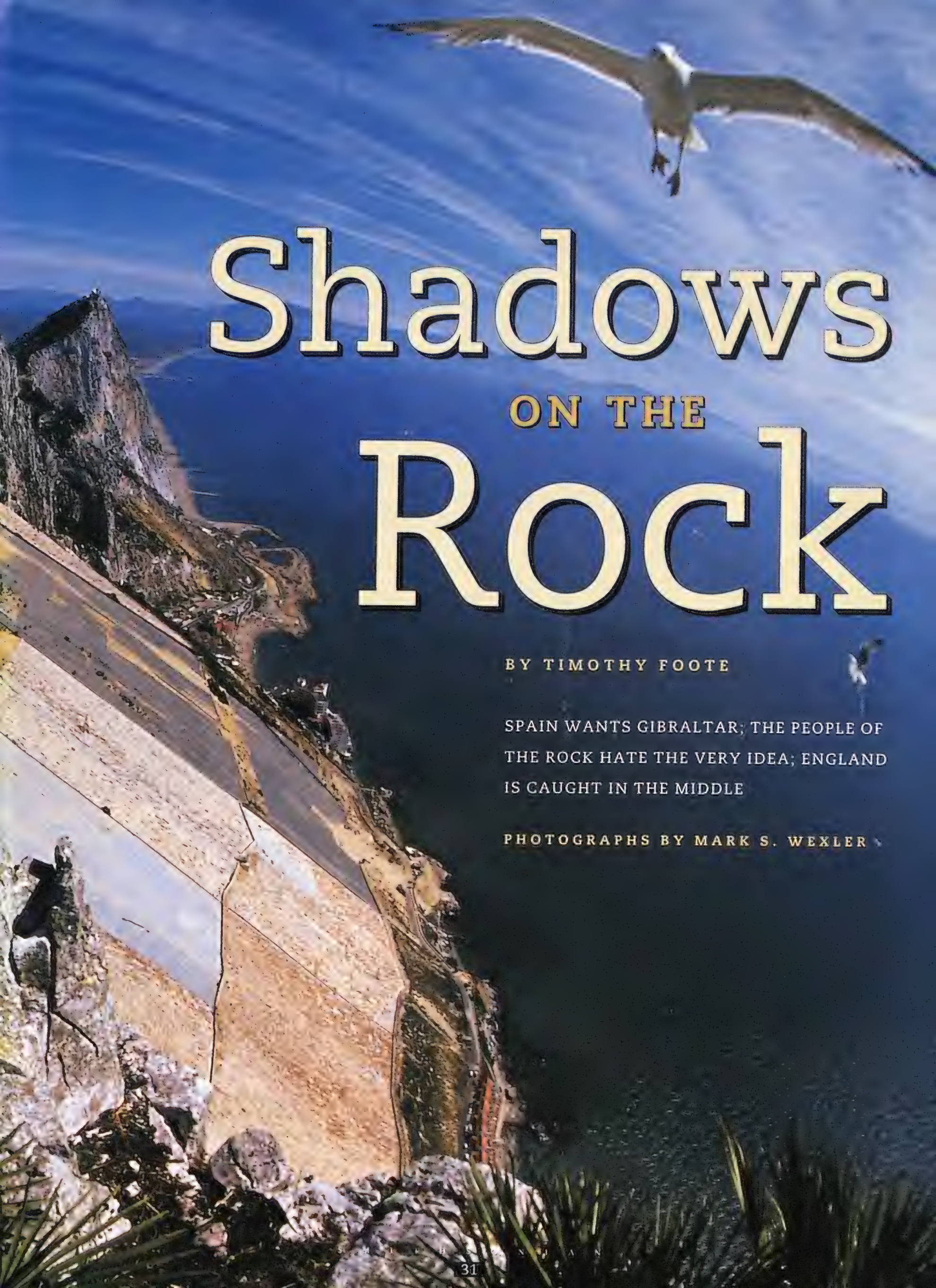

Shadows ON THE Rock

BY TIMOTHY FOOTE

SPAIN WANTS GIBRALTAR; THE PEOPLE OF THE ROCK HATE THE VERY IDEA; ENGLAND IS CAUGHT IN THE MIDDLE

PHOTOGRAPHS BY MARK S. WEXLER

GEOGRAPHY IS DESTINY. IN GIBRALTAR'S CASE, SO IS GEOLOGY. The place is an amazing excrescence of rock, three miles long and a fifth of a mile high. It heaves up out of the Mediterranean like some petrified, Jurassic-age sea monster umbilically attached to the tip of Spain by a sliver of isthmus.

The very top is an outpost of the upper air. Each fall half of the birds of Europe sweep close over it on their way to winter in Africa. From gunports cut through the rock high on its northern face, you can get a quick and spectacular fix on a couple of Gibraltar's crucial problems. From that looming promontory made familiar by Prudential Life, which keeps pressing us to "get a piece of the Rock," you could practically toss a stone across the border into Spain and (at least on windless days) spit to Gibraltar's notoriously inconvenient airstrip, built out into the sea, and attached crosswise to the nose of the Rock, more or less like a cat's whisker or half of a mustache. Off and on for years now, every car or moped or pedestrian entering or leaving the Rock has had to cross the runway, often after a wait of hours because Spain still keeps Gibraltar under quasi siege.

The high, jagged ridge of the Rock provides a long view into history. Southward lies Africa, a pastel rim of sand only 20 miles away, barely defining the blue of the sea. It was from there that the forces of Islam came in A.D. 711 to take the Rock, fortify it and move on, conquering Spain and half of France. To the west, just around the corner off Cape Trafalgar, Horatio Nelson was killed in 1805 while destroying a Franco-Spanish fleet. The Battle of Trafalgar changed the course of history, forcing Napoleon to give up hope of invading England. Just down Gibraltar's western slope is the tiny curved bay into which HMS *Victory*, Admiral

Enduring imprints of England include: cricket (Gibraltar has four cricket fields and plays international matches); the big Union Jack painted on the stairs people take to visit the Devil's Gap and feed the Barbary apes; and 220 local constables trained and hatted like London bobbies. "Very quiet," this one commented while pounding his beat on Main Street. "A lot of what I do is pose for tourists."

Nelson's crippled flagship, was towed after the battle, with the great seaman's body aboard, preserved in a brandy-filled cask.

Farther still to the right lie the quays and breakwaters and the three once-bustling dry docks of Gibraltar's harbor. In the late 1930s, I remember, photographs in the *Illustrated London News* showed the harbor packed with famous ships of war, among them the doomed battle cruiser *Hood* and *Ark Royal*, the aircraft carrier whose planes would slow Germany's great battleship *Bismarck* enough so others could sink her. After France fell in June 1940, it was from Gibraltar that British ships sailed down the Mediterranean to fire on the French fleet at the Algerian port of Oran (SMITHSONIAN, July 1985). That heartrending action, done so that French ships could never fall into German hands, convinced Franklin Roosevelt that the British would fight Germany alone and to the end, and thus were a good bet for American aid.

During World War II some 16,000 soldiers were billeted in the bowels of the Rock, amid mountains of food and millions of rounds of ammunition, as well as water and gasoline holding tanks, some of them three football fields long, carved out of solid rock; the whole complex was linked together by 25 miles of tunnels. From those depths Gen. Dwight Eisenhower, his presence a total secret, directed America's surprise 1942 invasion of North Africa. (Modern military experts who play what-if war games have found that when Gibraltar is awarded to Hitler—he was poised to come down through Spain and take it, but turned away—the German side wins World War II.)

These days Gibraltar's famous harbor is mostly empty. All that remains of the Royal Navy's Gibraltar squadron are two small gray boats, about the size of sportfishermen. But in British hands for the past three centuries, Gibraltar became a world-famous bastion of empire, a naval base and fortress now haunted by historic memories; for most people, it is the very symbol of trade and sea power, the perfect icon of unshakable reliability.

During that time, mainly reckoned

by the events and tactics of war, the fortress also gradually became a colony and a duty-free port with a population of 31,000. Its people play cricket, speak English, hope for the colony's success as an offshore investment center, would mightily like independence—and once voted overwhelmingly never to belong to Spain. Yet today Spain's demand to have Gibraltar back, along with Britain's objections and the shouts and cries of the Gibraltarians themselves, considerably preoccupy the councils of the United Nations and the new European Union, where Gibraltar's future may finally be decided.

Spain's initial logic was clear. After World War II the U.N. decreed that colonial powers should divest themselves of their colonial possessions. Gibraltar is a colony as well as a fortress. Once England gives it up, the Spanish argued, Spain's 284-year-old right of first refusal, established by the Treaty of Utrecht in 1713, automatically applies, and Gibraltar must be returned to Spain. It seemed as simple to them as Q.E.D., but it soon became very complicated indeed.

In 1964 the United Nations told Britain and Spain to settle things between them. With that as an excuse, in 1969 Generalissimo Francisco Franco abruptly closed Spain's border with Gibraltar. It stayed shut for 16 years. Phone service with Spain was cut off. Nothing could cross the border, either way. No cars, no trucks, no tourists, not even 6,000 Spanish citizens who worked in Gibraltar and lost their jobs as a result of the closing. Airplane flights to and from Gibraltar were not allowed to touch down in Spain before or after.

World attention has lately been drawn to the fate of another British colony, the one—rich as Croesus—that has just fallen into the Big Brotherly arms of China. But compared with Gibraltar, the matter of Hong Kong was simple, being clearly a case of a 19th-century colonial grab at profit from tea and opium. China had the strength to take it back. Britain hadn't the means to hold it. Gibraltar's situation, by contrast, has roots that reach way into the past. The two countries involved have played a considerable role in the bloody and convoluted history of Europe—its wars of religion, its wars of turf—in the time when nations fought so frequently that politics in fact was war carried on by other means. And they are part of a new Europe dedicated to the hope that Europeans have given up such things for good.

Whatever the long-term rights and wrongs of the matter, the short-term fuss owes a good deal to long-simmering Spanish outrage, stemming from an event that took place in 1704. In that year warships commanded by Adm. Sir George Rooke sailed in and opened fire on the Spanish fortress of Gibral-

Left: People cross the runway between flights. Above: The view from the west shows the airstrip and the Spanish border, at left, the breakwaters of Gibraltar's harbor and, center, modern condos, offices, apartment buildings and marinas.

tar. In the thousand years since Moorish forces landed there, the place had been besieged ten times but rarely conquered, so it was a surprise when the great rock surrendered after six hours of bombardment by Rooke's guns.

When the victors moved in, the vanquished Spanish, whose presence there amounted to a small garrison and a few thousand civilians, moved out, carefully carrying with them a special Gibraltar flag with a gold key and a red castle on a white field. Spain's famous queen Isabella had designed it some 200 years before, just at the time when she had retaken the fortress and driven the Moors back to Africa. The centuries of savage fighting required to do that pitted Islamic jihad against declared crusade. Participants tended to cut off the heads of enemies and stick them on posts or, in a celebrated case, to skin an enemy commander, stuff the skin with straw and leave it hanging over the battlements for years.

Not unnaturally, Isabella regarded the Rock of Gibraltar as the key to the future defense of Spain and Christianity; she adjured her countrymen to hold it at all costs. Accordingly, though the Spaniards displaced by Admiral Rooke moved out, they moved just a few miles north to the tiny town of San Roque, declared themselves temporarily "Gibraltar in Spain" and confidently waited to return.

Spain has been waiting ever since. By the Treaty of Utrecht in 1713, Gibraltar was formally ceded to England "in perpetuity." There were some stipulations, however. In addition to Spain's right of first refusal if England ever decided to get out, it was specified that the English were to permit no smuggling of goods, such as tobacco, from Gibraltar into Spain, nor allow Moors or Jews on the Rock.

For the proud Spanish, the original loss was galling enough. Just then the energy inherent in Spain's vast overseas empire was starting to drain away. No one is quite sure why, though Spain clearly had bad luck with royal bloodlines, including several monarchs who—even by monarchical standards—were far from the sharpest knives in the drawer. Gibraltar fell to England during the War of the Spanish Succession (1701-1714), a multinational fracas in which foreign armies fought on Spanish soil to decide, ignominiously for Spain, who was going to sit on the Spanish throne.

The loss to upstart England made it bitterer still. The English had pros-

pered steadily from the time when a handful of cheeky ship captains pillaged King Philip II's treasure fleets for Queen Elizabeth (SMITHSONIAN, January 1987). To Spaniards, as early as the late 1500s, Britons were damnable heretics and piratical Protestants. To Englishmen, Spain was a hotbed of bloody-minded Papists, much given to religious conversion by means of auto-

A battered HMS Victory, Nelson's flagship at Trafalgar, is towed back to Gibraltar after the battle in 1805, carrying the admiral's body in a brandy-filled cask.

da-fé. A piece of British Naval bluster, celebrated by Lord Tennyson, summed up this extreme view: "Sink me the ship, Master Gunner—sink her, split her in twain! / Fall into the hands of God, not into the hands of Spain!"

By force of arms and diplomacy, all through the 1700s Spain tried to get Gibraltar back. Between times it complained a good deal about tobacco smuggling, which became a Gibraltar specialty. In 1727, the Spanish government also berated Great Britain for its failure "to protect our Holy Religion" by allowing Moors and Jews in the fortress.

Britain, however, did not quickly warm to its craggy new possession. Once it was almost swapped to Spain for East Florida. But that was before 1779 and the "Great Siege of Gibraltar." A crucial moment in Anglo-Spanish relations that became the 18th-century equivalent of a media event, the siege was part of a global war, Britain against France and Spain—and its own unruly American colonies—fought in Spain, in India, in the West Indies and, as the American Revolution, in places like Bunker Hill and Yorktown.

The siege began in July 1779 and ran for three years, ten months and 17 days. France and Spain invested 45,000 men, 400 artillery pieces and a combined fleet of 40 ships. The British garrison consisted of about 6,000 men, plus some 3,000 civilians, and everybody had to eat. To the French and the Spanish it looked like a sure thing.

Appropriately enough, Gibraltar's governor at the time, George Augustus Elliott, was a vegetarian. He slept only four hours a night. "Not a man whom it would be easy to surprise or starve out," a contemporary noted. When people had to scrounge the rocky slopes above the town for roots and reeds and thistles and wild onions, the governor set an example by going for eight days in a row with nothing to eat but four ounces of rice per day.

Smallpox broke out. Then scurvy. There was enough derring-do to fuel the "Hold Fast for England" daydreams of generations of British schoolboys. Royal engineers on the Rock were the first to use "hot shot"—cannonballs fired red-hot at the enemy. It was touchy work just handling them. There was also a risk of explosion whenever a ball was rammed home against the powder charge.

Over in America, General Cornwallis eventually surrendered for Britain at Yorktown. But the besiegers were determined to take Gibraltar before peace negotiations could interfere. And they had a secret weapon—a bright young French engineer named Michaud D'Arcon who claimed he could transform regular wooden ships of the line into vessels that would be both "*incombustible et insubmergible.*"

What he did was reinforce one side of each ship's hull with layers of green oak, in all more than six feet thick. (Think of those railroad ties stacked up on our Civil War ironclad *Merrimack.*) The hulls were roofed on a sharp slant so shells would carom off. More ingeniously, D'Arcon installed a water tank on each vessel, with pipes leading all around the ship, and pumps, to keep the wood soaked.

D'Arcon's mystery flotilla, referred to as the "battering ships," got to be big news in Europe. The duc de Crillon, who commanded the siege forces, grew impatient. Like Groucho Marx in *Duck Soup* who had to have a war because he'd rented the battlefield, the duke had already invited the wealth and beauty and power of Spain, and even France, to come down and see Gibraltar fall. At last he gave D'Arcon an inflexible deadline. On the 13th of September, after a barrage of fire from hundreds of guns ashore and afloat, and while picnickers watched from across the bay, D'Arcon's ten battering ships, with 172 guns

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between them, were towed to within 900 yards of the fortress, dropped anchor and began firing.

At first, consternation reigned among the English. The battering ships took hit after hit, with no sign of damage. Then, at about 2 o'clock, a whisp of smoke, not from its own cannon, rose from the 21-gun *Talla Piedra* on which D'Arcon served. More smoke, and flames, followed. Soon, with the battering ships sinking, and in danger of exploding, desperate crews swarmed overside. By the next morning most of the ships were sunk or were charred to the waterlines. That day a westerly wind blew ashore corpses and ammunition boxes and, one account tells us, "large candles such as are usually burned by Romish priests before their altars."

That was the end of the real siege. During its course the French and Spanish fired off 258,387 rounds of shot and shell, and used up more than 8,000 barrels of gunpowder. Most of the houses on the Rock lay in ruins.

Spanish schoolchildren would eventually be taught to recite the words "*Gibraltar es Español.*" It took a couple of hundred years, however, before their country had any realistic hope of making good on that assertion. Back home in England the Rock had become a prized British possession.

For today's visitor, the Rock that Spain has so long wanted more than a piece of is a spectacular place, part Prospero's island—with 143 caves, those miles and miles of tunnels and the spectacular Alameda Gardens—part history-museum-on-the-hoof with battlements and gunports both refurbished and not, as well as some 400 cannon, ancient and modern, a few still lying around in the grass like old hubcaps in vacant lots in America. "Back home," Gibraltar-based American businessman Matthew Coffey said to me, "whenever we find a cannon we polish it up and build a park around it. Here they're used as curb guards." There is also the

Spanish children would eventually be taught to recite the words "Gibraltar es Español."

During World War II 16,000 soldiers were billeted underground and used miles and miles of tunnels cut from solid rock.

Gibraltar Museum, one of the best of its kind I've ever encountered. There is a fancy new waterfront, built out into the sea from the old city walls, complete with condos and office buildings, cafés and marinas and a labyrinth of slips for "megayachts," as hungry ads hopefully put it.

From the center of town a cable car now takes visitors 1,200 feet up to a kind of snack bar with tables, balconies and a great view, but elsewhere the heights are reached only by a few scrubby, switchback roads. Up there live the famous Barbary apes, which drew Winston Churchill's attention during the beleaguered days of 1943. (He did, in fact, order more apes from North Africa because the colony was thinning out and superstition says that if the apes ever leave the Rock, the British will, too.) The ape colony numbers about 250 and is cared for not by British soldiers, as in *Scruffy*, Paul Gallico's book about a hellion ape of that name, but by Gibraltarians.

"Don't take much with you, Sir," my driver said when I proposed to check them out. "The monkeys have a game of snatching cameras and throwing them off the cliff. They also fancy long earrings on the women."

Down inside the oldest part of town, it is easy to understand that the place can be a bit claustrophobic. This is partly a matter of size. One generally thinks of a colony as including at least some land, if only for purposes of colonial exploitation. Gibraltar encompasses only 2.25 square miles, with 31,000 people, mostly crowded along the water's edge.

The Governor's Palace in the old part of town is called the Convent, because that's what it was in the 1400s. It has a baronial dining hall, a soaring chapel and a walled garden, which the likes of Benjamin Disraeli and Ulysses S. Grant visited. Kaiser Wilhelm II and a flock of British royals even planted trees there to mark their passage. The governor (there is a different one now) provided an Olympian but candid briefing. Yes, the British government had been a bit too slow about naming the financial committee that would be able to guarantee, in terms that Europe would accept, the propriety of the offshore trading and banking business Gibraltar must have if it is to survive without British help.

But that would soon be fixed. (It was.) Yes, the long-term smuggling of tobacco into Spain, most flagrantly at that time by what were known as "Winston Boys" (teenagers in black jackets who every evening zoomed off into the Mediterranean night in small speedboats), caused Spanish ire, and was bad for negotiations. Yes, one trouble in Britain's talks with Spain about Gibraltar has been a Spanish disinclination to recognize the Gibraltar government at all.

Outside, on Main Street (the name itself a surprise in a place where one keeps bumping up against abandoned cannon and signs reading "The King's Bastion" and "The Prince of Wales Gate, 1790"), the scene is a cheerful mix of a Mediterranean port and provincial

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Going to or coming from the Rock, shopping bags like these are standard equipment. In Gibraltar cigarettes sell for about half the price asked in Spain.

England in the 1950s. There are policemen in bobby hats, just like in London, as well as pretty girls in shorts, grandmothers in head scarves, young bloods in leather jackets, and mopeds zipping by each other at close quarters. Pubs, like the Angry Friar, serve steak and kidney pie (£4.75) and a ploughman's lunch, including a half-pint of bitter (£3.74). Stores are stacked with some 14 brands of cigarettes. Street awnings and men's billed caps advertise (yes) Winstons, Marlboros, Rothmans and others. Cartons cost around £8—about half what they bring in Spain. Gibraltar is a very bad place to give up smoking.

Gibraltarians seem extraordinarily easy and polite in dealing with the world and each other. Perhaps because the place is so small, or because people born here rarely leave (and try to come back even when they've studied abroad), it's a little bit like being in a small town, the kind of genial melting-pot community that America used to be all about. They all study in schools with an English curriculum, and they all speak English—and Spanish—as well as tossing in words from a local patois, which is neither English nor Spanish, called Llanito.

They carry British passports and admire the English considerably, especially as a result of the past 30 years, during which they have negotiated more and more self-government. The British have "run down" their expenditure on a dwindling fortress base from some £8 million a year to almost nothing, but have stood by Gibraltar in the face of Franco's siege and its aftermath. Gibraltarians are not English, however. A notable local cricket player told me, "The English believe that if you play cricket you'll think the way they do. But we don't."

Nothing more sharply defines the difference between the Gibraltarians and the British than their attitudes toward the Rock's contribution to World War II. For the British, and all Allied powers, it was a triumph. But many Gibraltarians think of it as a disaster. Why? Because, with Hitler expected to attack through Spain any minute, the British in 1940 not only canceled many hard-won political rights for the duration but shipped 13,000 Gibraltarians (all women, children, boys under 17, men who did not have essential jobs—"all useless mouths" as they put it) to safety in places like Jamaica, Madeira, south London and Northern Ireland.

In the struggle between the rights of colonists and the military needs of the fortress, the fortress always had to dominate, as Gibraltar historian Tom Finlayson makes clear in his book *The Fortress Came First*. Within living memory Gibraltarians have always had a relatively high standard of living, employment and education, but they did not get to vote until 1921. As one told me, "We used to say to the British, 'You've given the vote to people still wearing loincloths, why don't you give it to us?'" It was during their wartime diaspora, though, that Gibraltarians learned how to lobby British civilian authority and launched their first civil rights party.

Their diaspora also helped them to become what they are—neither Spanish nor English but a unified and independent-feeling group, its bloodlines derived from the many Genoese families who have been in the fortress for more than 300 years, and a large community of Sephardic Jews, some descended from those expelled from Spain by Queen Isabella in 1492, plus a heavy sprinkling of English, Maltese and Portuguese, and some Moroccans. The Jewish burying ground has gravestones that go back four centuries. All this seems to have resulted in an equable society, with a close, Mediterranean style of life, underpinned by English Common Law, and here and there with Anglo-Saxon attitudes. Interested anthropologists who study Gibraltarian culture—and the Gibraltarians themselves—claim that the people of the Rock have evolved into a separate culture, partly because they have so long been conditioned by being

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In the beleaguered days of 1943, Winston Churchill ordered more apes from North Africa because the colony was thinning out and superstition says that if the apes ever leave the Rock, the British will, too.

closed in, resulting in a defensive "fortress mentality." Lawrence Sawchuk, a professor at the University of Toronto, has been studying local customs for 20 years and regards the place as a unique godsend to social anthropology. Many Gibraltarians live, Genoese style—crowded but convivial—in extended families with houses facing each other around a patio. In an age much given to dislocation and mobility, many families have lived for nearly 300 years in the same houses.

Even the Gibraltarians who, like Finlayson, win scholarships to universities in the United Kingdom, tend to come back, though the place is so small that there aren't many top-level jobs. Albert Brooks, a retired administrator from the Ministry of Trade, explains: "Everybody knows everybody. You went to school with them or knew their aunt or mother." But the main pull is Mediterranean and familial. When I asked a man who regretted not having seen more of the world why he hadn't joined the British Navy, he explained, "My mother said, 'That would mean you'll be gone forever.'"

Gibraltarians like the Spanish people, and often marry them, though this does not much change the family names on the Rock. It is mostly the men who marry Spanish women—known to make good wives. Still, it is not too strong to say that right now Gibraltarians pretty well hate the Spanish government and cannot imagine how it could create the hardships it did by closing the border. They naturally see the matter close-up and personal, not as an ill-advised policy that failed to force the British off the Rock, even at a time when Britain had a weak, pre-Margaret Thatcher government. (To imagine the political appeal the border closing must have had for General Franco in the mid-1960s—an aging dictator in a nationalist country whose popularity was fading—think of how Fidel Castro might feel about a bold move that had a real chance of reclaiming Guantánamo Bay.)

For Gibraltarians, the countless pinpricks and pettinesses that resulted are as real as a sore tooth. Everyone remembers that the Spanish even refused to let across the ambulance that carries oxygen to the Gibraltar hospital. One man mentioned his mother's deep sorrow at not being able to go to her own mother's funeral, just a few miles away. Albert Brooks remembers that when his sister, over in Spain, was expecting a baby, she arranged a two-blanket signal (boy or girl) that Albert could see with his telescope.

The border closing was a bad idea that should have been abandoned when it failed, and certainly after Franco's death in 1975. It put Spain in a bad light in an age much given to asserting "rights of self-determination" for what U.N. committees call "non-self-governing territories." Initially Spanish diplomats were forced to insist that the return of Gibraltar to restore Spain's "territorial integrity" mainly involved turf, and the governments of two ex-colonial powers, but not the rights of the people of the Rock. This allowed Britain to take the moral high ground with a referendum in which thousands of Gibraltarians voted and all but 44 opposed joining their lot with Spain's. Britain was also able to expand Gibraltar's self-government considerably with a new constitution that promises never to abandon Gibraltar to any political fate that is against the will of the colony's people.

Recently, Spain has held out the possibility that Gibraltar could have some sort of special status under Spanish rule. But Gibraltarians insist that if they become part of Spain, they would have to live like strangers in their own land. A series of eloquent chief ministers from the duly elected domestic government of Gibraltar, Sir Joshua Hassan, ex-labor leader Joe Bossano and, more lately, Peter Caruana, have repeatedly argued the case for Gibraltar's right to "self-determination" before various U.N. committees. They have also questioned the common sense of

using a clause from a 284-year-old treaty—whose other clauses no longer apply to the world today—as a basis for Spain's claim in 1997.

The Gibraltar clause in the Treaty of Utrecht was, in fact, part of a voluminous document, much like a modern GATT agreement, in which half a dozen countries settled all sorts of issues including trading rights. Is it still valid? the Gibraltarians ask. Are the other clauses valid, like the one in which France signed over to England her permanent right to sell slaves in the West Indies? And what about Spain's other claim, the need to restore Spain's territorial integrity? The Spanish held Gibraltar for 251 years. The British have held it for nearly 300. The Arab world, which fortunately is not laying claim to it at present, owned Gibraltar—as well as a good deal of Spain—for 700 years.

If the United Nations should declare that Gibraltar has an absolute right to self-determination like other larger "non-self-governing territories," neither the Gibraltarians nor anyone else is sure what options its people may realistically hope for.

For the colony, as for the fortress, geography remains destiny. Europe has some tiny countries, most of them with bizarre but long-established traditions. Andorra, a 179-square-mile mountain valley between France and Spain, lives on tourism and international banking, and mostly runs itself under the joint supervision of the president of France and a Spanish bishop. San Marino, at 24 square miles, is, next to Vatican City and Monaco, the smallest independent state in Europe and lives by ancient treaty in the heart of Italy, mostly by selling its own postage stamps. Monaco, at .73 square miles, is smaller than Gibraltar but is a rich playland and tax haven, and has been a sovereign independent principality since 1297. As one long associated with a museum complex, my vote would be for Brussels to declare the whole of Gibraltar the first international museum of the new Europe, run by Gibraltarians but with a multinational board to help it develop as a financial and tourist center in conjunction with southern Spain, where unemployment currently runs at 23 percent.

Failing that pipe dream, it is not clear what Gibraltar's government leaders can aim at, beyond (first priority) not falling into the hands of Spain. Whatever rights get proclaimed, or not, Gibraltar will have a hard time of prospering, or turning the fortress into a thriving tourist and financial center, without continued British support and eventual Spanish approval. Spain, relatively new to parliamentary democracy, has some domestic political problems. But it will take a bold politician in Madrid to give up at last on the Rock. England's new Labor government may not prove as inclined as Conservatives were to live up to the guarantee. But not long ago the British fought a war over the Falklands on principle, and it will take a bold prime minister to be the one who finally breaks the word of Her Majesty's government to the people of the Rock.

Board Editor Timothy Foote last wrote on America's westward rush in 1846. Mark Wexler is a three-time winner of the World Press Award for photography.

Wading into the wilds of a swampy stretch of bay, zoology graduate student Lisa Carswell nets butterflies and dragonflies in a pioneering inventory venture.

The Riddle *of the* Carolina Bays

BY KEVIN KRAJICK

AS FAST AS SHE CAN MANAGE, SOUTH CAROLINA ZOOLOGY GRAD student Lisa Carswell, 24 years old and five feet tall, is hurdling fallen trees, butting through thick bushes and sprinting in thigh-deep water while grasping a butterfly net that's a lot longer than she is. Her eyes never leave the prey. "C'mere, buddy," she says, suddenly swinging like a major league batter at something small and airborne. Today she might get lucky and perhaps snag a rare insect never seen around here. Maybe even an unknown species. "You never know," she says.

"You never know" is a good motto for the Carolina bays, the locale for her hunt. The confusingly named bays are not ocean inlets; nor are they confined to the Carolinas, though that is where they lie thickest. They are eerie wetland depressions scattered across the Eastern coastal plain from southern New Jersey to northern Florida. Most of them are perfect ovals; they are ringed by ridges of sand as high and dry as their interiors are low and swampy; and all point the same way, northwest to southeast. They have long fueled weird local folklore, bewildered geologists and scared off most everyone else.

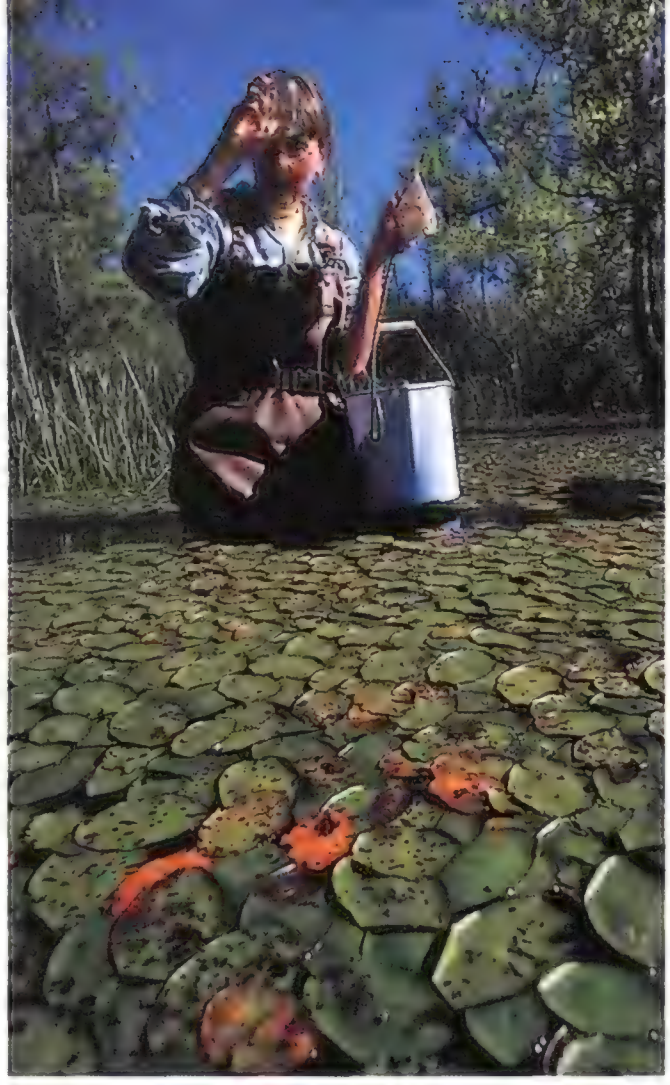
Today Carswell is inventorying butterflies, dragonflies and damselflies in bays—the first such study in a region settled for close to 300 years. That's because few biologists want to go in there: bays are often surrounded by, or even filled clear through with, impenetrable walls of shrubs and 12- to 30-foot-

PHOTOGRAPHS BY CAMERON DAVIDSON

An aerial view of fields and woodland in North Carolina's Hoke County reveals the forested oval of Antioch Bay, a site now protected by the Nature Conservancy.

high tangles of thorny plants. Inside there may be chest-deep black water and muck, alligators, assorted venomous snakes, and a dozing bear or two. Viewing bays as hostile wastelands, farmers and loggers have long drained them, cut their valuable old trees and replanted them in crops.

Perhaps nine out of ten bays have disappeared this way; the rest are largely surrounded by farms, tree plantations and houses. As pioneers like Carswell finally explore the survivors, they are finding themselves in mini Loch Nesses, refuges for a wealth of rare, little-studied plants, amphibians and birds, some found nowhere else. Photographer Cameron Davidson and I discovered in them places of unutterable beauty and mystery.



Outfitted in waders, aquatic ecologist Barbara Taylor collects zooplankton samples from Flamingo Bay in southwest South Carolina.

Most of America's mountains, rivers, lakes and plains had been named and their natural histories described before geologists realized such a phenomenon as the Carolina bays existed. Settlers did note many low, wet areas crammed with bay trees, holly, myrtle and other waxy-leaved evergreens and sharply divided from the surrounding plain by banks of beach-white sand hundreds of feet across. And for one 19th-century geologist these curious landmarks—depressions ringed by sandy ridges—created the impression of "a circular race-course . . . [with] quite an artificial appearance." Throughout the region, including the Carolinas, they came to be called "bays" because of their distinct interior vegetation, often characterized by the presence of bay trees. Over the years, many individual bays have acquired names, each no doubt with its own long-lost story: Dismal Bay, Bushy Lake, Wildcat Bay, Otter Slide, Raven, Indian Camp, Marry Branch, Old House, the Desert, Rake Shin, Horseshoe Lake, Sheriff White, Chancy and (one of my favorites) Wam Squam, to mention just a few.

But for well over a century, no one knew the bays' astonishing uniformity and extent, because they couldn't see the big picture; the debut of aerial mapping photography in the 1930s smacked everyone in the face with it. Scattered below were thousands of similarly oriented ellipses, ranging from an acre or so to 15 square miles—far more, and more perfectly identical, than anyone had imagined. For the first time, little bays could be seen nested in big ones or overlapping neighbors. It was as if a great hand had flung fistfuls of rocks at an angle into the damp earth, each digging a pockmark and leaving a pushed-up ridge where it plowed in. Studies since then have found no underlying rock formations to explain their presence. Only uniform elliptical lakes in Tierra del Fuego, near the north coast of Alaska and on the high plains of Texas resemble them.

No one even knows how many bays there are, since no definitive study has emerged. Estimates from different researchers range from 20,000 to 200,000, depending partly on whether you're including ones that have been drained. Most, perhaps up to 80 percent, seem to be clustered around the Cape Fear region where North and South Carolina meet. For example, Bladen County, North Carolina, is perhaps 45 percent bays. In neighboring Robeson County, Tom Ross, a geographer at the University of North Carolina at Pembroke, has tallied 8,000 and is still counting. "I'd never heard of them until a colleague showed me an aerial picture 29 years ago," he says. "I've been hooked ever since."

Along with typical densely vegetated "bay" wetlands, basins clogged with up to 15 feet of dark, ancient peat, many other wet environments are contained, island-like, in bays. These include savannas carpeted with rare flowering plants; spooky cypress swamps; a dozen or so clear, open lakes; and endless combinations and offshoots of the above. I have never seen two bays alike; each has its own assemblage of creatures, its own atmosphere. What they have in common is that almost none connect with surrounding streams or rivers. They sit alone, depending on rain and/or subterranean water to feed their up-and-down water levels. Variable hydrology and isolation from surroundings may be among the keys to the singularity of their ecology.

Radiocarbon dating, pollen studies of basin sediments and other evidence yield conflicting bay ages, from 10,000 years to 250,000—just one of the problems for geologists. The original theory of how they formed is still the most popular: a giant swarm of meteors pelted the region at a sharp angle, which would account for their regional concentration, largely uniform direction and features such as bays within bays.

AMONG SOME 20 COMPETING THEORIES FOR THE ORIGIN OF the bays, taken with varying degrees of seriousness:

- The basins were carved out by a series of artesian springs that moved around overlying sediments.
- Dissolved-out limestone formations gave way to sink-

holes that later were shaped into ovals by groundwater.

◆ An ancient sea bottom was scoured by submarine eddies or currents (the area was ocean at one time).

◆ Icebergs beached on the old shoreline nestled into the sand and then melted (glaciers didn't make it this far, so they're not responsible).

◆ Giant schools of fish waved fins over loose sea bottoms to create depressions used for spawning.

◆ Beached whales were squirming and struggling to get back in the water ("whale wallow" is the local term for a bay in the Delmarva Peninsula).

One plausible explanation: after ancient seas receded, irregular, shallow depressions along the coast filled with water. Most geologists agree that these depressions were elongated by strong prevailing winds, and the resulting waves, into the consistent direction and shape we see now. Redistributed material ended up on the "beaches"—the sand ridges. The mini-lake interiors then turned swampy as layers of dead plants built up. Some of these bays, fed by additional subterranean water, remain as lakes, including the five-mile-long Lake Waccamaw in Columbus County, North Carolina. Mark Brooks, a geoarchaeologist at the University of South Carolina, says new radiocarbon dates and ground-penetrating-radar profiles indicate wind and water were shaping bay lakes in South Carolina up to just 4,000 years ago, when most finally progressed into wetlands. He has uncovered troves of stone tools and hearths on sand rims, suggesting ancient people camped on shores until the lake view (and probably the good fishing) disappeared.

But Brooks admits he has no proof for how the original depressions got there, nor an explanation for bays within bays, or the lack of bays in other places. Neither does anyone else; and so, though geologists roll their eyes, the cult of meteor theory thrives. "Everyone around here will tell you that's what it was," says Brooks. "It's the mystical explanation." The Waccamaw Siouan, a small, bay-country Native American group, have a tradition that Lake Waccamaw, their most sacred spot (and the largest known water-filled bay), was created by a fireball from the sky. It's unclear just how old this tradition is, though. Tribal elder Roscoe Jacobs, 75, told me, "It came from the ancestors." But he also admitted he first heard it when he was 11 or so—exactly when aerial photographs, and the meteor theory, came out.

Geologists are still searching for a complete explanation. Biologists have picked up the ball with new studies of the bays' profuse flora and fauna. Some botanists think carnivorous plants may have evolved to adapt to the wet, acidic soils in bays and similar environments. In addition to Venus flytraps, growing wild nowhere in the world except the heart of bay country, bays do in fact harbor many types of carnivorous plants. These include bladderworts, whose flow-

Carolina bays offer refuge for an astonishing array of flora and fauna, from the insectivorous pitcher plant (flowering, top, and full-leaved, below) to wading birds, such as egrets and wood storks (dark head); reptiles, including the black racer snake; and amphibians, such as the southern toad.

ers dangle bladder-like traps in the water, sticky-leaved terrestrial sundews and pitcher plants with gorgeous trumpet mouths where "guests" check in but they don't check out.

Then there is the incredible variety and quantity of frogs, toads, newts, salamanders and other amphibians, along with armies of snakes, turtles and lizards. Whit Gibbons, a herpetologist at the University of Georgia's Savannah River Ecology Laboratory who has monitored several small bays for almost three decades, told me that one year he and his colleagues counted 200,000 leopard frogs moving into or out of a single site—one for every inch of shoreline. Bays are ideal amphibian habitat, he points out, because they typically fill with water in winter and dry periodically in summer like a giant mud puddle. Dry spells, as well as isolation from surrounding drainages, keep most free of fish, who can decimate frog populations in permanent ponds.

John Fauth, an ecologist at the College of Charleston, has counted in one bay 16 species of frogs, plus several salamander species, showing up to breed after a thunderstorm. They pop out of leaf litter, climb out of trees and revive in bottom mud where they've dug in to wait, sometimes for years, for the right water level and season. Since different amphibians breed at different times, competition is contained and diversity maintained. Fauth believes bays may be among the final refuges for some amphibians, declining in the Southeast, as they are worldwide, largely due to habitat destruction. Among uncommon or endangered ones not often found elsewhere: big (up to 13 inches) tiger salamanders, crawfish frogs, gopher frogs and pine barrens tree frogs.

Lake Waccamaw is a special case for aquatic creatures. Its expansive shallow basin is probably the most biologically rich water body on the East Coast. Among its 60-some species of fish and mollusks are at least 6 that don't live anywhere else at all. The Waccamaw Siouan were long ago evicted by settlers, and sections of the lake's shores are lined with vacation homes. But endemic mussels like the Waccamaw spike are so prolific, waders routinely crunch them underfoot; unique minnow-like Waccamaw silverside fish swim by the hundreds in shallows off docks, prey to any kid with a perforated coffee can.

North Carolina's 224-acre Jones Lake is set within a 630-acre, wooded bay. Diverse habitats shelter creatures from bobcats to endangered red-cockaded woodpeckers.

Night is the best time to see amphibians, so one spring evening around 9 P.M. Fauth and I set off in hip boots to Tunstall Bay, an open, grassy wetland near the hamlet of Wagram, North Carolina. As we waded on a moonless, overcast night into a thigh-high open pool, he unraveled the threads of a polyphonic roar around us: southern cricket frogs (*gick, gick, gick*), southern leopard frogs (*chuckle, chuckle*), little grass frogs (a high trill). Fauth assured me there were no alligators. "Well, probably not, anyway." We shined our headlamps straight through crystal water to a pine-needle-lined bottom. Flittering in the water inches from our faces were typical bay dwellers, including hundreds of ornate chorus-frog tadpoles with iridescent bellies and high tail fins like '50s Chevrolets. Young Mabee's salamanders with extravagant reddish gills undulated powerfully.

The amphibians were feeding on a mind-boggling menagerie of aquatic invertebrates, and vice versa. Hydrophilid beetles and larval caddis flies encased in decayed plant stems zipped through the water. We saw quivering clouds of zooplankton shaped like shrimps and fleas. Fauth carefully avoided picking up a single, long, black-and-tan larva of a dytiscid beetle that skimmed the surface; it feeds on small amphibians, and its vicious pincers can inflict a nasty bite on people. Resting on shoreline twigs we saw sizable *Dolomedes* spiders, which dive into the water for frogs, then drag them up onto grass blades to devour them.

University of Georgia aquatic ecologist Barbara Taylor,

I NEVER FOUND THE COMPANION THAT WAS SO COMPANIONABLE AS SOLITUDE. - Thoreau

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LIKE A ROCK

Even when a bay has been plowed and planted, a vestigial, or "ghost," bay is detectable from the air: rings of dark, peaty soil remain visible in southeastern North Carolina.

who has collected aquatic invertebrates in bays since the 1980s, says she has found that microcrustaceans in the bays "are among the most diverse of any found in temporary ponds in the world." Recently, Morgan McClure, while a master's degree candidate at Clemson University in South Carolina, collected 243 species of aquatic insects in a handful of bays, including 2 new species and 19 never before seen in the state. Lisa Carswell, also at Clemson, hopes to fill in the blanks regarding terrestrial insects. "Everything is new. Everything is a contribution to science," says Dale Soblo, a director at the South Carolina chapter of the Nature Conservancy, the group sponsoring Carswell's work in hopes of identifying rare insects and plants in South Carolina bays.

Bays are unquestionably havens for rare birds, including the endangered wood stork. These prehistoric-looking giants, with necks and beaks resembling the gnarly, ancient trees they nest in, once bred exclusively in the Florida Everglades. Canal construction and other development have driven them farther north to some bays, including Big Duke's Pond, a huge, unusually deep one in east-central Georgia's Jenkins County. Biologist Larry Bryan of the Savannah River Ecology Laboratory guided Cameron and me there one day. We pushed through clouds of poison ivy on the rim and then waded into a cypress swamp of chest-high water carpeted with green duckweed. Bryan couldn't offer Fauth's shaky guarantee about alligators. "They're here," he said. "That's one reason the storks like it. Raccoons don't dare come in to eat their eggs. It's a happy arrangement. Unless a chick falls out of the nest."

After a slow quarter-mile wade through deeply shaded water laced with submerged logs, we came to a sunny central pool. Four yellow-bellied slider turtles were lined up by size on a floating log. Seventy to 90 feet above in the cypresses were the wood storks—hundreds of them, all silent, many incubating unseen eggs on huge stick nests. Like dwellers in a secret city of peace, many shared limbs with nesting anhingas and great egrets. The only sounds were the soft squawking of egrets and an occasional flapping as the shadow of a stork's 5½-foot wingspread passed by. "I think they picked this spot because the trees are spaced enough that they can maneuver," whispered Bryan. Nearby bays with more typical shallow bottoms are vital foraging spots, as the storks' stubby legs won't let them get at aquatic prey in water more than 20 inches deep.

Many songbirds, too, appear to be taking refuge in deep bay interiors as forest habitats elsewhere shrink. Not long ago Lisa Mamo, then a graduate student at the University of North Carolina at Wilmington, chainsawed narrow lanes through the vines and shrubs of otherwise impenetrable bay swamps in Bladen County, North Carolina, to net birds inside—the first such study. Within the bays, she has banded wood thrushes, Eastern wood pewees, and yellow-billed cuckoos, all feared to be declining nationwide.

One day we accompanied her and her adviser, biology professor Eric Bolen, when they netted a gorgeous hooded warbler, plumed in yellow and black. Recently listed as a top priority by conservationists, the bird had probably come up from wintering grounds in South America to breed here. Mamo has captured and recaptured hooded warblers nearby in successive years, showing they are loyal to their summer homes. Such thickets also provide black bears with some of the few remaining retreats that hunters can't easily reach. Joe Hamilton, a wildlife biologist on the staff of Ducks Unlimited in South Carolina, says bears seek out the densest, most inhospitable, of the thickets and make a pile of sticks to nap on.

Bays form last-ditch refuges for plants rarely found outside them, such as Boykin's lobelia, awned-petaled meadow beauty and quill-leaf. As they do for amphibians, bays provide the seasonal water levels many plants need for germination or

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growth. And a typical bay concentrates many distinct habitats in a bull's-eye ring, starting with the deep, watery center and working its way out to the rim, where sand bare as a New Mexico high plain harbors desert dwellers like prickly pear cacti and twisted little turkey oaks. A few years ago John Nelson, curator of the herbarium at the University of South Carolina, and a colleague, Stephen Bennett, uncovered 17 populations of Canby's dropwort, up till then thought to survive in fewer than five sites in North America.

Unfortunately, people have long known that some bay plant life has economic value. Deep within, bays harbored Atlantic white cedars—straight, rot-resistant, slow-growing. George Washington had holdings in a corporation that clear-cut many such trees; today it is rare to see an Atlantic cedar of any size in the bays. The same is true of centuries-old cypresses; many were long ago turned into shingles. Now harvesters are literally stooping lower: poachers armed with shovels and hunting knives illegally raid shrinking Venus flytrap populations for sale to plant shops and tourists.

Farmers discovered that bays could be drained and planted with soybeans, corn or tobacco. Cameron and I flew over Bladen and Robeson counties one morning, courtesy of David K. Clark, a local land developer and amateur pilot who showed us hundreds of "ghost bays": elliptical rings of dark, peaty soil, some no bigger than backyards, incorporated into big plowed fields of lighter surrounding dirt. Many had remained intact right into the 1960s, when readily available backhoes, high crop prices and government tax breaks for wetland drainage brought a wave of destruction.

Wetland conservation laws and a shortage of easily destructible bays now make all but piecemeal conversion difficult. However, smaller bits are still being filled for new houses and such. Sun Bay, near Aiken, South Carolina, was converted to a parking lot a few years back; Whit Gibbons, who had studied its amphibians, saw salamanders returning uselessly for years to try to breed on the asphalt. Intractable moisture and subsiding peat have exacted revenge on house dwellers, though, by rotting floors and cracking foundations.

In the past decade, the Nature Conservancy and states have saved dozens of bays—usually the ones that survived by being the biggest, meanest, most "worthless" of all. But even many of these are in trouble. Some are being invaded by aggressive, fast-growing trees from surrounding plantations. Once-frequent wildfires, which swept bays free of invaders, have long been rigidly controlled. This practice has led to further declines in rare herbaceous species that need fire to stimulate germination or to clear woody shrubs that shade them out.

One day, as we drove along Highway 72 in the flat coun-

The 58-acre expanse of Cathedral Bay, preserved by the state of South Carolina, contains soaring stands of pond cypress.

try outside Pembroke, North Carolina, the road began curving for no apparent reason—a common occurrence in bay country, where high sand rims have long served as templates for highway routes in the low-lying landscape. Alongside we saw a telltale great, dark ring of peat in a field. Nearby was retired farmer Murphy Locklear, Jr., 72, stooped over a rake. He told us how he, his father and eight brothers and sisters had cleared this piece in the 1930s, with bush knives, mules and plows. Then they dug waist-deep drainage ditches by hand to keep water out. "Now, that was some hard work," he said. He couldn't recall how many years it took. "It'll grow most anything you put in there now." Across the road, his father and many other loved ones now rest in a little graveyard—like so many around here, located up on the easily dug sand rim. I pointed to the dark ellipse and asked him if anyone still called it a Carolina bay. He looked as if he'd never heard the term. "I just call it a field," he replied.

As we drove off I tried to imagine how this bay might have looked long ago. My mind went to Cathedral Bay, one of the most stunning I ever saw: a 58-acre ellipse of clear, knee-deep water near Olar, South Carolina, filled with a forest of buttressed pond cypresses. I had made my escape from everybody one day, to wander this magic kingdom alone.

It was around 6 P.M., and the dropping sun filtered through the trees. Starting from the northwest end, I hoped to walk the length of the ellipse, and so kept the sun on my right. After a few hundred feet, the sweetgum trees on the sandy rim disappeared from view, replaced by files of cypresses fading into the uncharted center. I walked and walked, and sure enough, after a while I came up on the southeast rim, where sand and sweetgums took over again. Then I turned back inside, sun on my left. For a long time it was silent and still. Something plopped down out of a hollow stump. Yellow bladderwort flowers floated on the surface, awaiting dinner. Around sunset there was a soft rippling sound; I saw a dark snake curl through the water and disappear behind rows of trees: Cottonmouth? Harmless water snake?

I emerged at the spot where I'd gone in, and found Cameron hollering for me. He'd been jolting around in his four-by-four through a plowed field that circled the bay's perimeter and screaming my name into the interior. He'd been at this for 45 minutes. "I thought you were in trouble," he said. "I was worried about you."

"I was not in trouble," I said.

The ecology of unusual places is a specialty for writer Kevin Krajick. When not wading in swamps, he and photographer Cameron Davidson intrepidly investigated nearby barbecue joints.

A model maker works on a cutaway that reveals the earth's structure. Part of the Plate Tectonics Gallery, the mock-up depicts the layers' varying temperatures. The illustrious Hope Diamond (opposite) will take center stage in the new hall.

A Gem of an Exhibition

BY MICHAEL KERNAN

FROM A 423-CARAT SAPPHIRE TO A VIAL OF STARDUST, THE SMITHSONIAN'S NEW HALL SPARKLES AS IT INSTRUCTS

PHOTOGRAPHS BY KAY CHERNUSH

DON'T WORRY. WHEN THE NEW JANET ANNENBERG Hooker Hall of Geology, Gems and Minerals opens on September 20, the good old Hope Diamond will still be the star.

True, it will share its grand domed display room with five giant objects that remind us just what gems are, after all, and where they come from, and where the planet itself comes from. There is a spectacularly lit 1,300-pound cluster of quartz crystals; a curious four-foot sand concretion from France that will rotate on a pedestal; the famed Tucson ring meteorite, as big as a washbasin; a great polished slab of migmatite from deep inside the earth; and a 325-pound sheet of solid copper mined in Michigan. The latter is there to tell us, no doubt, that the hall includes a realistic walk-through mine complete with actual veins of ore and semiprecious gems.

The new, U-shaped gallery has enough wonderful stuff to satisfy the professional geologist and the casual glancer alike. The minerals range from the dust of lost stars impossibly far away, to great, glistening clumps of crystals as tall as a man. A whole history of celebrated gems is on exhibit, dating to a time when South Africa's treasures were undreamed of. The stories of metals and their ores, of how rocks are formed and turn into soil, of what makes volcanoes explode and continents slide about: all these are told here.

But let's face it, the Hope is what people—six million a year—line up clear around the National Museum of Natural History's rotunda to see.

After it surfaced in the 17th century in France, a superb steely-blue, 112-carat handful, it was sold to Louis XIV, recut and set on a tortuous path of

18

ownership and gradual chipping away to the present stone. Louis XV had it, but it was stolen from Louis XVI during the French Revolution. George IV of England was said to have owned it, and later British banker Henry Philip Hope, from whom the gem takes its name, turned up with it in 1839.

Then in 1910 Evalyn Walsh McLean of Washington, D.C. found it at Cartier in Paris. Later she claimed it was cursed, because her husband and son met tragic ends. The New York jeweler Harry Winston bought it from her estate in 1949 (along with the 95-carat Star of the East and 15-carat Star of the South diamonds plus the McLean Diamond of 31 carats), and nine years later he donated it to the Smithsonian. It is now the 45.52-carat centerpiece of a pendant containing 16 white diamonds on a chain adorned with 45 more.

Once ensconced here, the Hope left the Smithsonian only three times—for shows in Paris, Johannesburg and New York. But when the team of 100 curators, designers and other experts who have been putting this new $16 million hall together since 1988 took a good look at the Hope, they realized it was more than somewhat shopworn and needed a bath.

So the pendant was secretly flown not long ago to Harry Winston, Inc., in New York and taken apart—the stones washed in soap and water and reset, the metal polished and the diamond officially regraded by the Gemological Institute of America. Then it was put on display at the jeweler's, complete with armored car and somber SWAT teams brandishing Uzis.

Back home now, the Hope is more than safe in the domed gallery donated by the Harry Winston Research Foundation. The high-security, freestanding exhibit case in which it is regally housed is the centerpiece of the gallery and was a gift from the security firm of Diebold, Incorporated. Placed on a rotating mount and illuminated by fiber-optic lighting, the necklace holds court behind panels of thick, "water white" glass so clear that it doesn't seem to be there.

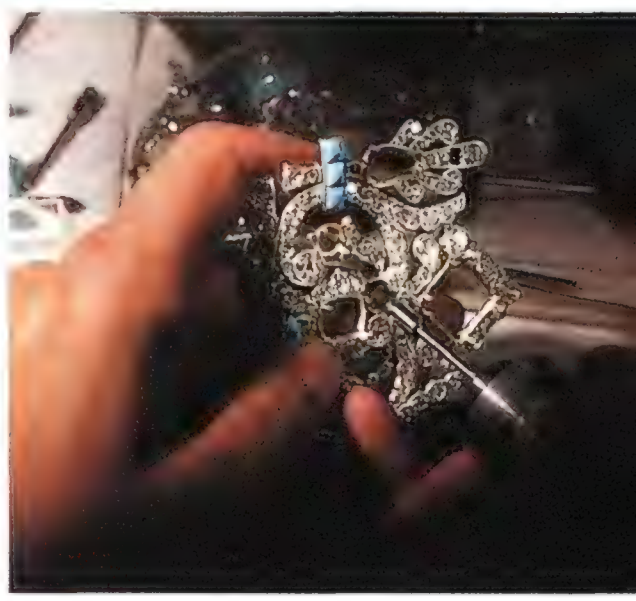
Moving on to the next room in the 20,000-square-foot hall, the public will see some 40 of the best-known cut-stone creations in the world, drawn from the National Gem Collection.

Perhaps the most sumptuous is the diadem that Napoleon gave to Empress Marie-Louise on the occasion of their marriage. I had a backstage look at this treasure (bottom right) when I visited the hall with Jeffrey Post, the research geologist and curator of the National Gem Collection who is overseeing the entire project. Post introduced me to Deborah Dubois, the jewelry artisan who has spent a good 100 hours virtually rebuilding the elegant diamond-studded crown.

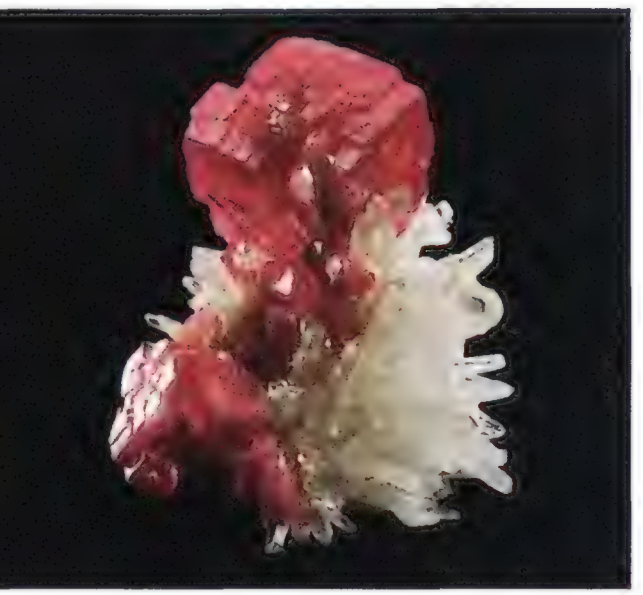
"The diadem came to us from Marjorie Merriweather Post," explained curator Post. "The original big stones were emeralds, but Van Cleef and Arpels took them out in the 1950s to sell them individually and replaced them with turquoise. It was in sad shape. The old soldering was broken in places and the piece had lost its luster."

Dubois had a diagram showing the position of all the 1,000-plus diamonds and 79 turquoise stones. She removed the epoxy with which some modern tinkerer had secured the stones, and set them back in their prongs as originally designed. When I saw the diadem it was sprawled across her table, the newly washed diamonds all alight.

For lovers of gem history, Post pointed out, the 1950s were a disaster. People were tired of the past and wanted to move forward. Rich families in Europe, their fortunes reduced to their heirloom diamonds by the war, sold the gems to jewelers like Cartier or Van Cleef and Arpels, where the diamonds were often removed from their antique settings and recut to modern taste. (Modern designs pro-



Behind the scenes: a researcher (opposite) checks on rock and mineral specimens stored in the "Cage"; collection manager Russell Feather (above, top) prepares mounts for the Evelyn Hall Sapphire Necklace, in his hands, and Marjorie Merriweather Post's emerald necklace, right; an artisan's skilled hands (above) conspire to restore the dazzling Napoleon diadem.



Showstoppers (from top): the necklace and ring from the Hooker Starburst Diamonds suite; naturally occurring rhodochrosite crystal nestled in quartz; the Hooker Emerald, said to have been cut from a stone worn by Ottoman ruler Abdul Hamid II.

duced more facets, more sparkle.) But today, nostalgia is back, and many collectors mourn those lost antiques.

Next, Post took me into the vault and opened just one of many drawers to show me a few of the other pieces going into the new gem room: the Napoleon Diamond Necklace, given to Empress Marie-Louise on the birth of their heir; the Hooker Starburst Diamonds (top left) and Hooker Emerald; the wonderful Star of Asia; the Marie Antoinette Diamond Earrings; the rare De Young red-and-pink diamonds; and a 23,000-carat topaz.

By the way, a carat is 200 milligrams, or one-fifth of a gram. Five carats weigh as much as a cubic centimeter of water, if you can picture it. So the 23,000-carat topaz weighs in at more than ten pounds.

"Every gem in the exhibition has to be mounted," Post reminded me, "and some mountings can take days or weeks to design and build. We have a contract with several bracket makers to do about 500 gems here, including the world's only alphabet carved out of diamonds. Plus they're creating mounts for a couple of thousand mineral specimens."

I was still gaping over the open drawer: the Chalk Emerald of 38 carats; the Logan Sapphire, probably the largest cut sapphire in the world, at 423 carats; the Portugese Diamond, which is a 127-carat, octagonal stone as big as a belt buckle.

"Before the South African diamonds were discovered in 1867," Post said, "diamonds came from India or Brazil. At that time the huge ones weren't so plentiful." So big stones were even rarer then than they are today. Curious.

Tearing myself away from the vault and all those unopened drawers, I considered the next section of the new hall—the Minerals and Gems Gallery. Here are close to 2,000 pieces demonstrating the connection between gems and the minerals they're cut from. The exhibition will have a "fast track" down the center of the room, succinctly describing what crystals are and why they grow, why some are rare and others not, why moonstones have special optical properties and so on. Along the walls is a trove of samples, interactive displays and videos for those who want to linger and learn more.

The mine comes next.

"Some people think diamonds come out already cut, as in Walt Disney's *Snow White and the Seven Dwarfs*," Post remarked. "This puts them in perspective. The National Mining Association let us into some mines so we could pick out what we wanted. They dug samples out and shipped them for us, like the vein of galena over there, which is lead ore and weighs about a ton. That must have cost some postage." The department had to cut the boulder in half, "with a huge saw we have downstairs," to better handle it.

Actually, the gallery's 1,600-square-foot mine contains four mines—zinc, copper, lead and semiprecious gems. Real ore veins and crystal pockets are set into rock-like walls skillfully painted to resemble a working mine.

"We put in a crystallized cave like those found at the Copper Queen Mine in Bisbee, Arizona," explained Post. "When the miners broke into such caves they found stalactites all in blues and greens, beautiful. That's reproduced here."

Also featured are videos of coal and copper mining that take the viewer from pickax to product, making us more fully aware of the difficulties involved in simply presenting the consumer with a nice copper pot.

After keeping my hands behind my back as I strolled by all those gem and mineral cases, I finally got to an exhibition that will have mostly touchable items—the Rocks Gallery. This section of the hall tells the story of how rocks are formed and altered by wind, water, gravity and the inconceivably powerful forces below the earth's skin.

CHIP CLARK/NMNH (3)

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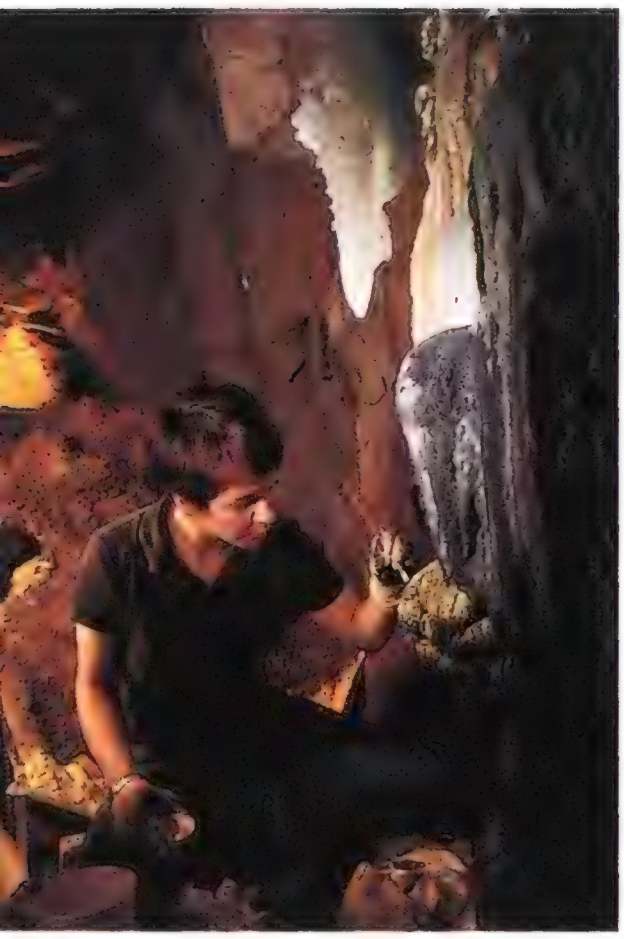

The walk-through-mine gallery integrates actual materials, such as the white and green stalactite, top, with reproductions of other mine features. Here, exhibits specialist Carolyn Thome meticulously applies a stain in order to replicate the color of real iron-oxide minerals.

Here are the granites, basalts and limestones of everyday life, the glacially striated rocks and big garnets, with descriptions of how they change and what that means to us.

Post took me into the "Cage," a specimen-preparation room the size of a small gym, whose floor was completely covered with enormous rocks sitting on pallets. There were so many that staffers had to plan days ahead which pallet they would need where ("It's like a ballet, moving 'em around") before they called for a forklift.

Rocks. I saw a topaz as big as a bushel. A boulder of jade. Sheets of mica the size of a newspaper. A bathtub-size meteorite. A mattress of lava. An amethyst bigger than a football.

"Some of these specimens had been in the old hall for 40 years," Post told me. "They were so dusty and grimy I wondered why we were displaying them." He wet a finger and rubbed the facets of the huge amethyst. Instantly it turned from a rock into a gem. "So we've been cleaning them and getting them in shape. The designers and bracket makers have their job cut out here, because these things are so heavy. Oh yes, and we have to have a database for all this stuff so we know where it all is."

Moving from small to large, we then entered the Plate Tectonics Gallery. Here, aided by a big-screen TV theater presentation at the beginning of the exhibition, and videos and computer interactives along the way, the public learns how the movements of enormous plates cause most of the earth's geologic activity—from earthquakes and volcanoes to the formation of mountains, which are nothing but a rucked-up rug on a rather larger scale.

There is also an impressive globe six feet high that shows our planet minus the oceans, making the vast plates stand out dramatically. Elsewhere a huge computer-generated map of the world depicts all the volcanic eruptions and quakes since 1960, demonstrating how they fall into patterns outlining the plates: the so-called Ring of Fire rimming the Pacific, for example. The rest of the gallery consists of a travelogue of other places in the world where plates are on the move: Iceland, where they are pulling apart; California's San Andreas Fault, where two plates are sliding past each other; and the Cascades of Washington State, where one is slipping beneath the other.

One exhibit, a cutaway of an active volcano, is animated to show just how the heat of the earth's interior bursts out to cause havoc and create islands (but, fortunately, doesn't include the flowing lava). Built by specialists in New York, as was the six-foot-tall globe, the volcano is painstakingly accurate.

The last gallery of the Institution's new hall—Moon, Meteorites and Solar System—deals with the early history of our planet and its solar system. Among its treasures is the oldest object known to us, a meteorite that is 4½ billion years old.

"Meteorites provide most of the information we have about the very early history of the earth," Post explained. "We have samples from the moon, from Mars and the asteroids. There is also a piece of a Mars meteorite that people can touch." Perhaps even more exciting to the imagination is a vial of extremely tiny diamonds formed when a star far outside the Solar System went nova, that is, blew up. "It's literally stardust," Post added.

The new hall has been a Smithsonian dream for a decade. The big problem, of course, was finding supporters who shared that dream and were interested in helping make it a reality.

"Mrs. Hooker, who is one of publisher and philanthropist Walter Annenberg's sisters, has always been interested in gems, and in museums," Post told me. "In 1977 she gave us the Hooker Emerald, 75 carats. And then a few years ago she was at a party in Palm

Beach where the plans for a new gem hall were being presented. She was intrigued with the idea and thought it was an important and worthwhile project. Thus began a relationship that led to Mrs. Hooker's donating $5 million in cash and her remarkable suite of starburst diamonds."

The starburst set, which she purchased in 1989 from Cartier, features a yellow diamond necklace of 245 carats, a diamond ring at 61 carats and a pair of earrings of 25 carats each. As usual, curators declined to put a money value to all these gems for security reasons.

"Most of the $16 million for the hall came from private sources," Post recalled. "That's what we were doing in those first years: developing the concept, raising funds, drawing floor plans, going through the old hall to decide which stones we would use in the new exhibition. We must have looked through about 100,000 pieces."

It took close to two years to mock up the 81 gem and mineral cases—figure out how many stones would go in a case and how they would be arranged. And then there was the labeling, the brackets, the installing.

For all the chaotic appearance of the hall in June, with the mine flooring still being applied and the Rocks Gallery not yet completed, an amazing number of exhibits were already in place. I had the feeling that everything was on the point of coming together.

Remembering New York's American Museum of Natural History gem collection, I asked how it compared with the Smithsonian's new hall. Post was not about to engage in debate on the subject, but he estimated that while the display in New York is comparable, the total collection is about half the size of the one in Washington.

"So who has the Cullinan Diamond?" I inquired, recalling from somewhere that this was for a long time the world's biggest. And what about the cushion-shaped Koh-i-noor?

Gleaming gems arrayed against a backdrop of amethyst crystals include, clockwise from top left: the 68-carat Victoria Transvaal Diamond; a heart-shaped amethyst brooch; cognac-colored diamond earrings; an Australian opal in a gold Tiffany setting; and the Evelyn Hall Sapphire Necklace.

"Oh, they're both in the British crown jewels. The Cullinan is in the scepter; the Koh-i-noor, in the crown."

Oh. Well, would you ever consider including replicas?

"No replicas. We've never had to do that. It's part of the reason why people go to the Smithsonian: they come to see the real thing. That's what makes it exciting."

Michael Kernan writes the monthly Around the Mall *column. Photographer Kay Chernush has ascended towering cranes in Chicago and traveled truck routes to Baghdad in pursuit of pictures for this magazine.*

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A Gift of a Garden

BY DAVID M. SCHWARTZ ◆ GREEN ACTIVIST DAN BARKER IS SEEDING MANY LIVES WITH HOPE

PHOTOGRAPHS BY ROGER FOLEY

AT 5 FEET 9 INCHES, LINDA RILEY IS A tall woman, but her tomato plants stand taller. She is pointing to the trellis she installed to support their burgeoning heft, and she is waxing astonished at the marvel that is her garden—three 5-by-8-foot raised beds spilling over with verdant abandon.

A single mother of three living in a low-income neighborhood of northeast Portland, Oregon, Riley works two part-time jobs and attends Portland Community College full-time. With help from food stamps and the U.S. government's WIC (Women, Infants and Children) program, she struggles to make ends meet. Certainly her backyard garden has made a difference on the kitchen table and in the checkbook, but Riley's greatest delight has been the dis-

covery that a garden is a place where more than plants can grow.

"Having this garden has been a growth experience for all of us," says Riley, pushing aside a pumpkin's coarse leaves to check on the fruit that she intends ultimately to freeze for Thanksgiving pies. "The family had to work together to decide what we wanted to eat and what we should plant. We planned it on graph paper and did research together on how much room we needed for the different vegetables. Before, I couldn't get the kids to eat anything green, but they love broccoli now and they eat beans right off the vine and cucumbers and beets and several kinds of squash."

That there is a garden at all in the backyard is the real marvel. Although Riley and her three children planned, planted and tended it, the garden itself was indeed dropped into their yard like heaven-sent manna. It came in the form of raised beds built out of two-by-eights and filled with premium organic soil—seeds, started plants and private lessons included. The bearer of this substantial gift was Dan Barker, a Vietnam vet and former nurseryman who decided in the spring of 1984 to begin giving gardens to people.

As a philosophy student at Oregon State University after he returned from Vietnam, Barker found inspiration in unorthodox places. "The language in the Gurney seed catalog was so much more vital than anything I was reading for my courses," he recalls with a convulsive laugh. "The catalog described vegetables in rapturous terms, and then quoted people saying things like, 'I had melons the size of trucks.'" This epiphany led him to a nursery job. He worked evenings in a convenience store where further inspiration came from a most unpropitious event: a robbery at the cash register. Four thieves entered the store; one of the thugs held a gun to Barker's head for ten minutes. The experience triggered thoughts that ultimately would serve to reshape his life.

Years later, recalling the events, he tempers the memory's bitterness with compassion. Tomorrow he will nail boards into garden-bed frames and haul wheelbarrow-loads of soil, but on this drizzly April evening he is intent on explaining how he came to embrace these menial tasks in order to achieve a greater good. "I thought about the people who presume it's OK to steal from other people engaged in honest labor because they themselves have been deprived of what they need. I realized that altering that presumption means altering their needs: that requires changing their environment."

FINDING A MISSION

BUT HOW? HE CONSIDERED HIS OWN childhood in a family crippled by poverty and violence, and a brother who had spent nine years in prison, later dying from a heroin overdose. He even considered his family's diet. "We grew up on Spam and frozen French fries. There was an occasional artichoke but never a fresh tomato; no one had even heard of basil." Perhaps a family garden would have helped, and in more than one way. "It has always been the American tradition to take care of yourself, but there are a lot of people who can't, so I decided that if you give poor people a garden, you encourage them to help themselves. You give them something to do and you give them something to eat."

Dan Barker's idea was to build gardens for people in need—the elderly, disabled and poor. He would construct the beds, provide all the materials, including soil, and impart the know-how, but the recipients would do the rest of the work, from planting through harvesting. He founded the nonprofit Home Gardening Project (HGP) with a $5,000 grant from the Department of

In Portland, Oregon, a typical day unfolds for Barker and his Home Gardening Project: he hauls a wheelbarrow of soil to fill raised beds as his assistant, Kevin Dowling (behind, in cap), gives advice to a family.

Housing and Urban Development (HUD). The money went for lumber and soil—enough to build and fill 21 raised-bed gardens. A seed company donated outdated but still viable seed packets. (Barker prefers raised beds: the soil warms faster and drains better, is less accessible to weeds and pests, and is easier for gardeners to work.)

Procuring the supplies proved easy. The hard part was giving them away. Barker walked the streets of Lents, one of Portland's most blighted neighborhoods, talking with people and asking, "Anyone want a free garden?" No takers. He left behind 200 leaflets advertising "Free Vegetable Gardens!" and went home to wait for the phone to ring. "It was very, very difficult to convince people I would give them something for nothing," Barker recalls.

By month's end he had three calls. He built the first garden for a man with muscular dystrophy, and the next two for low-income, single-parent families. After he had completed these three, the word spread: the man really does come to your house with a pickup truck full of wood and soil, and when he leaves you have a garden. For free.

Finally, the phone began to ring. It has never stopped. That year, Barker put in another 18 gardens, each costing $250—about what a family of four might spend in a few months on food they would now be able to grow for themselves. Since 1984 the HGP has installed more than 1,400 gardens. Barker estimates that at least 95 percent of them have been successful—which he defines as producing a "substantial yield." Impressive as those figures are, they represent a fraction of the demand. As I sat in Barker's home office on the April day when we met, he received nine calls—including a request for 271 gardens at a housing project!—but his docket was full for the year. Unfortunately, HUD funding, formerly $16,000 a year, had dried up in 1996.

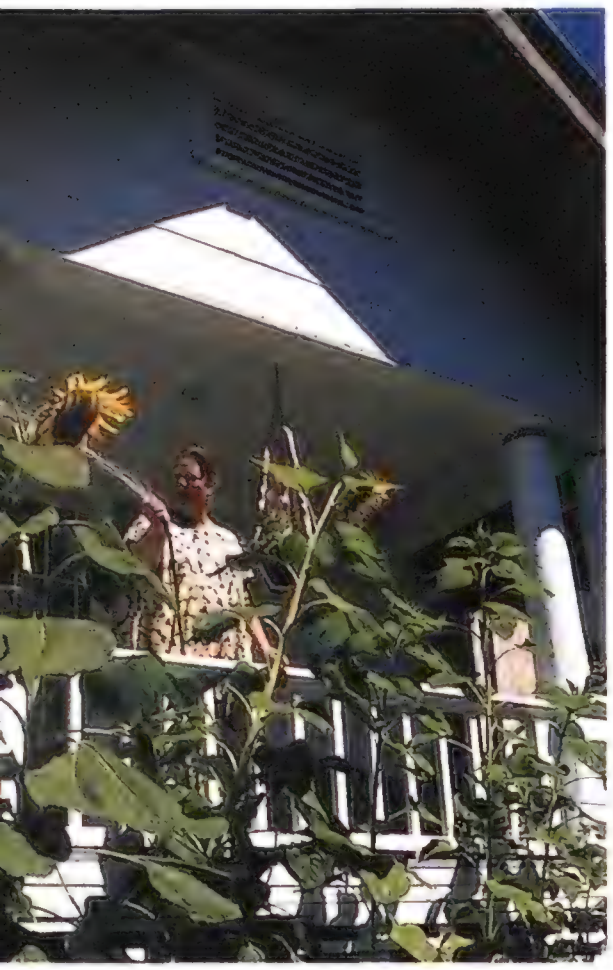
Despite the need to step up local fundraising, Barker (who takes only a subsistence salary from his grants) cannot be found in his home office during the daylight hours. "I want to meet the gardeners," he says, flipping through a file folder of letters from former clients. The folder is almost as wide as the grasp of his muscular hand. "Some of these people haven't had a good thing happen to them in 20 years, and now, at the very least, they have zucchini to give away and tomatoes to brag about. Once they've succeeded at their garden, they begin to think of other ways they might succeed. They write or call to say, 'After we got involved in this program we got involved in another program and then another and now we've got jobs.'"

The next day, I go with Barker and his assistant, Kevin Dowling, to a dilapidated four-unit apartment building in North Portland. In a sunny spot of lawn behind the building, Barker and Dowling frame out three garden beds, then take turns at the wheelbarrow, hauling soil from the truck and dumping it into the beds. With wood and string, they build a simple trellis for vine crops, nailing its base to the long side of one frame. The last hammer stroke seems to be the cue for one resident, whom I'll call Jane, to exit the house and greet the builders. She lives here with five other adults and two children. The apartment building is a group home for low-income adults with AIDS. (At their request, their real names have not been used.)

Stooping to his knees and signaling Jane to join him, Barker explains the

composition of the soil and the importance of maintaining good drainage by not compacting the soil. Step outside, never inside, the beds. He talks about planting in "blocks"—square areas where the seeds are spaced evenly.

Finally, Barker gets to the good stuff. He hands his new client a gallon-size plastic bag stuffed with seed packets,



Gardener Deborah Johnson surveys the soaring lattice of sunflowers that has transformed her porch into a bower.

then starts poking an index finger in the soil, leaving a grid of two-inch-deep holes. "If the seeds are large enough to hold individually, plant three in each hole—one for yourself, one for a neighbor, and one for God. If they are too small to hold, mix them in a bowl with soil, then broadcast the mixture over the area." He makes some suggestions about where to position the plants in the beds: salad crops on the outside because they grow fast; tomatoes, broccoli and other big plants in the middle; peas, beans and cukes next to the trellis; squash in the corners so it can spread beyond the box.

As Barker helps Dowling load the pickup, he promises Jane he will return in a few weeks with tomato, eggplant, pepper and basil plants. He'll come again in midsummer to check on the garden's progress, and he will mail a triweekly newsletter with gardening tips and seasonal recipes.

In late August, I revisited the house in North Portland. The garden had flourished in chaotic glory, and the gardeners—which is to say, everyone in the group home—were abuzz about it. "It's incredible the number of people that this one garden can feed," said Greg, who had become the chief harvester and vegetable cook. "We can make a full dinner with no meat, and we have to shop just once a week."

Looking up from the sofa, where he was leafing through a magazine, Tom waits for an opening in the conversation. He is emaciated, and his speech is slow, but he is determined to make his point. "Every time you go to a doctor's or the HIV Center, everyone says you have to eat green vegetables, but where do you get the money? Social Security and food stamps only get you partway through the month. We still don't have any money, but now we have a gold mine of vegetables!"

Although most HGP gardens go to families, a growing number are installed at group homes like this one, or institutions such as senior centers, nursing homes, hospices, women's shelters and schools. In choosing his clients Barker gives preference to elderly and disabled people, and he tries to adapt the garden to the needs of the gardener. For wheelchair users or others limited in mobility, he builds "double-highs"—beds that are 16 inches high instead of the usual 8.

Gardening was not an option for many of the elderly who attend programs at the Marie Smith Center, an adult day-care center for seniors disabled by strokes and dementias, until the HGP built three double-high beds. "Senior centers have had traditional garden plots for years," says Monica Beemer, the center's program director, "but they were not accessible to people in wheelchairs or people who can't bend well." Beemer and the staff knew many opportunities were being lost, so they contacted Dan Barker.

GREEN-THUMB THERAPY

FANNIE SMITH CAME TO THE CENTER in a wheelchair, eventually moved up to a rolling walker and now uses a cane. She and Monica Beemer believe that gardening had a lot to do with her progress, both psychologically and physically. "It's excellent for improving fine motor function," explains Beemer. "You're working with your fingers. You grasp things, pull things, bend and lift. If you've had a stroke, you can utilize the affected side."

Deborah Johnson, another client across town, faced two obstacles: almost no space for a garden and almost no ability to do the work of gardening due to a back injury. Barker found a solution to the first problem by making half-width beds and squeezing two between Johnson's driveway and the fence of a neighbor, and two more between the front porch and the street. Johnson overcame the other problem by tapping a large pool of child labor—her own seven children.

In the Johnson garden, nothing earned more kudos than the sunflowers, eight-foot giants growing out of the boxes and up the porch, transforming the appearance of the house as well as the attitudes of its residents. Johnson cooks greens for dinner every night, but it's the sunflowers everyone notices. "I can say we live on Prescott and we're the family with the sunflowers. My children even sprayed the heads with salt water, dried them out and ate the seeds. This house used to be plain and dull, but now look at it!"

Clearly Dan Barker's seeds of self-empowerment have sprouted and flourished, but the true indication of their fecundity can be found outside Barker's home range, where others have begun to clone his idea. The first was Richard Doss of Olympia, Washington. In 1993, as a senior at Evergreen State College in Olympia, Doss decided to write a paper about the Home Gardening Project for a senior seminar on sustainable development. A fellow student who had previously encountered Barker in a terse mood warned him that Portland's master gardener "hates to help students write papers." So Doss disguised his intentions with what he calls "a little white lie."

"I wrote him a letter and told him I was starting a project like his and asked for an informational interview. I enclosed a self-addressed, stamped envelope, and he wrote "OK" on the back of a business card and sent it back to me. I was sort of nervous when I went down there. The first thing he asked me was, 'So, are you writing a paper?' I denied it, and we talked for many hours. And by the time we were through, I had decided that I would start a project just like his!"

Barker, who had just written a booklet called "How to Give Gardens to People," became Doss' mentor and friend. Through the auspices of his college, Doss put 22 gardens in Olympia neighborhoods and on the Skokomish Indian Reservation. The following year, he raised funds for the nonprofit Kitchen Garden Project, which built 86 more gardens. In 1995, spurred by funding from more than 20 local foundations, the KGP expanded north to Tacoma and Seattle. In 1997 it gave away more than 200 gardens. Thirty-five went to Head Start preschools, where the response has been so strong that Doss has set a goal of offering gardens to every subsidized low-income preschool in western Washington by the year 2000.

Other garden giveaway programs have cropped up in Brooklyn, Chicago, Detroit, Albuquerque, Missoula and Asheville. Foundations and other donors want to see results quantified in terms of food value. Five hundred dollars is usually the figure given for the value of food produced by the average HGP garden in a typical summer.

For Home Gardening Project participants of any age, a bountiful harvest is the reward for months of weeding and watering. Here, 9-year-old Bry Birdwell and his 5-year-old brother, Patrick, feast on homegrown produce, from squash to strawberries.

But Richard Doss thinks that bean counting of this sort misses an essential point. "Gardening isn't farming," he says. "It's gardening. You grow for yourself and you pass the surplus over the fence to your neighbor. How do you quantify the benefit of knitting a family or a neighborhood together?"

Yet, Dan Barker knows that the dollar signs are now being counted, and counted upon, more than ever. Late last year, he stopped running the Home Gardening Project and moved to Jacksonville, Oregon, to found the Home Gardening Project Foundation. His goal was to start new gardening projects modeled after the HGP in 200 cities around the United States. Because start-up is the hardest part, the foundation will partially fund each city's project for two years. Then, with a track record and vegetable plots to prove it, individual programs will have to persuade local donors to give money that will be converted into additonal vegetable gardens. "There are a lot of people who need work and a lot of people who need gardens," Barker says. "With the welfare system changing and the health-care system failing more people, gardens are the most inexpensive method of community preventive medicine I know."

David M. Schwartz cultivates his own garden in Northern California. Photographer Roger Foley is based in Arlington, Virginia.

The first planet to be discovered around another sun, orbiting at a surprisingly short distance, 51 Pegasi B is depicted here as a gas giant.

Planets Around Other Stars Are Hot Hot Hot

SUDDENLY WE FIND THAT LOTS OF NEARBY STARS HAVE THEIR OWN PLANETS, EVEN THOUGH SO FAR WE CAN "SEE" ONLY THE GIANTS ◆ **BY STEPHEN P. MARAN**

VISIONARY ASTRONOMERS SUCH AS FRANK DRAKE and the late Carl Sagan, and philosophers centuries before them, had long predicted that our solar system was not unique: that out in the reaches of space, other planets were circling other suns, and we had but to find them. Now it appears that we have indeed found them.

We have also been surprised, even stunned. The experts had confidently expected that the alien systems, if any were found, would resemble our own. Instead, the new discoveries remind us that ignorance is not just bliss, it is also a lack of imagination. The newfound planets show us not only that a solar system is not a rare commodity but that ours may be plain vanilla. The solar systems of other stars apparently come in flavors of every description. Moreover, their strange properties hint at bizarre pasts, not just for those solar systems but perhaps even for our own. At least one theory developed to explain the distant solar systems suggests that Earth may have had other sister planets, besides those now

known, that were swallowed by the Sun.

The newly detected planets were a long time coming. The last planet to be discovered was Pluto, in 1930. After that there were only false alarms until 1992, when a few small planets were found circling a tiny dead star called a pulsar. Then, in October 1995, the Swiss astronomers Michel Mayor and Didier Queloz announced that they'd detected signs of a planet around the star 51 Pegasi in the constellation Pegasus, the winged horse. Since then, at least eight more have been found.

(The nine new planets include one object reported in August 1988 by David Latham of the Smithsonian Astrophysical Observatory, which was not accepted as a planet at the time. It is now counted as a planet by many experts, although Latham himself is not so sure.)

All the reported planets orbit stars within 100 light-years of Earth, stars that are readily seen with binoculars or small telescopes by observers in the Northern Hemisphere.

Those stars are Sun-like, but the new planets are most unearthly. Conventional theory predicted that their solar systems would resemble our own, with small, rocky planets like Mercury, Venus, Earth and Mars near the central star, and cool gas giants like Jupiter, Saturn, Uranus and Neptune on the outskirts. But that's not what was found. Instead, we have worlds like 51 Pegasi B and 55 Cancri B—each considerably closer to its star than Mercury is to the Sun—racing around their stars in just over four days and just over two weeks, respectively. We don't know if they are rocky, but they sure are giants, and some are unbelievably hot, with temperatures that may reach 1,800 degrees F. Although 51 Pegasi B is at least 75 times more massive than Mercury, Venus, Earth and Mars put together, it's actually the lightest of the new planets.

Some other new planets, which I call the "eccentrics," have pronounced elliptical orbits. This is in clear contrast to the near-circles traversed by Earth and its neighboring planets. The eccentrics' orbits take them out great distances, whence they plunge back toward their stars, moving faster and faster, like riders on toboggans with no working brakes. On an eccentric planet such as 70 Virginis B, winter is long, summer is short and the contrast may be exceptional. Stranger yet is the eccentric 16 Cygni Bb, which revolves around 16 Cygni B, itself a member of a binary star. Beebee, as I call it (the new planets do not have official names, like "Jupiter" or "Mars"), has the most pronounced elliptical path

Paul Butler, left, and Geoffrey Marcy, at the Lick Observatory near San Jose, California, have found six of the nine new planets.

of any known planet. By one estimate, Beebee comes within 56 million miles of its star (16 Cygni B) at nearest approach and swings out to more than 250 million miles from the star at the opposite end of the orbit. (In our solar system, Beebee's path would take it from well inside the orbit of Venus to far beyond Mars and into the asteroid belt.)

At least, that's the situation now. But 16 Cygni A, with no known planets of its own, just won't leave Beebee alone. With its powerful gravity, it repeatedly perturbs Beebee's orbit around 16 Cygni B, according to Matthew Holman of the Canadian Institute for Theoretical Astrophysics, in Toronto, and two colleagues. This behavior, they calculate, can lead to a situation where Beebee sweeps around its egg-shaped orbit for millions of years, then transfers into a simple circular orbit (like a model train diverted from one track to another by a rail switch), then reverts back to the ellipse.

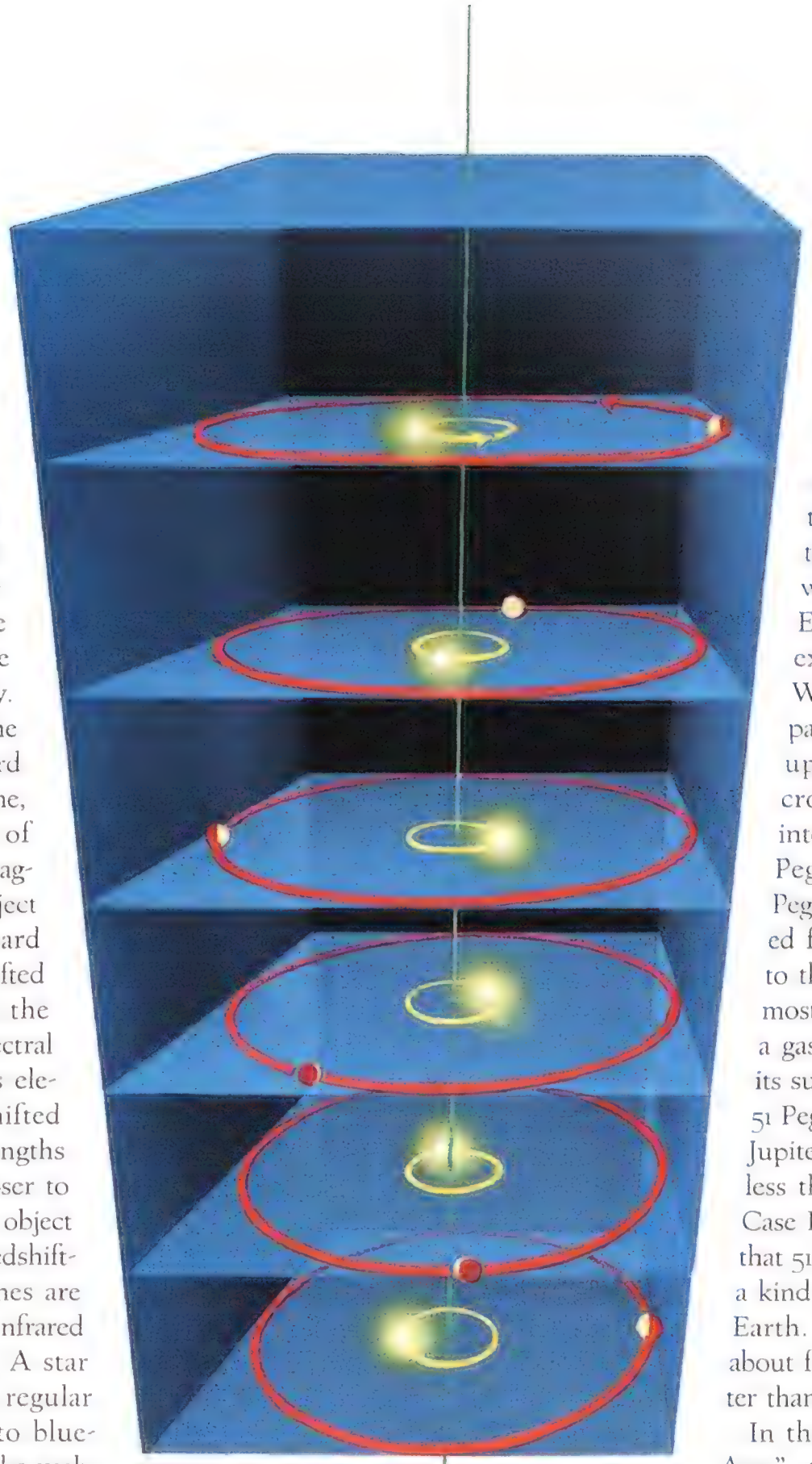
In the wake of the new planet discoveries, theories are blooming. Seekers of life elsewhere in the Universe are redoubling their efforts. The questions are, what are these planets like, how did they reach their strange present orbits and might they actually harbor life? The answer to the last one is, like the litany in a commercial for a rental car company, "Not exactly." The planets of the pulsar are bathed in lethal radiation from the tiny star. The planets in star-hugging orbits, like 51 Pegasi B, are just too hot. The eccentrics found so far are so massive, ranging up to at least ten times the mass of Jupiter, that they are generally regarded as gas giant planets, with no land or other suitable environment to support life, unless it's life that floats among the clouds. But the gas giant planets of our solar system have solid moons, including one, Jupiter's Europa, that may actually have liquid water (SMITHSONIAN, May 1997). And so inventive thinkers propose that some of the alien planets already found may very well have one or more moons capable of supporting life.

Not one of the new planets has been directly seen or imaged. Even the largest planet would be up to a billion times fainter than its star, and lost hopelessly in the stellar glare, if located at the same distance as Jupiter is from our sun. The giant planets that are closer to their suns are brighter accordingly, but the closer to the star, the greater the interfering glare. Everything that is known or strongly suspected is deduced from the planets' gravitational effects on their suns. When a planet orbits a star, the two are actu-

GERRY GROPP; ALL BACKGROUNDS SETH SHOSTAK

ally orbiting the center of gravity of the two objects (right). The star itself orbits this imaginary point. If the star were close enough and we could make accurate enough measurements, we would actually see it shift position in the sky. Currently, there is only one case of a star whose wobble may have been seen direcly. In most cases, however, the star will be moving toward us on Earth some of the time, and away from us some of the time, as it orbits that imaginary point. When an object like a star is moving toward us, the light from it is shifted toward the blue end of the spectrum. That is, the spectral lines produced by various elements in the star are shifted from their normal wavelengths to more energetic ones closer to the ultraviolet. When that object moves away, the light is redshifted: those same spectral lines are shifted toward the cooler, infrared portion of the spectrum. A star whose light moves in a regular rhythm from redshifted to blueshifted and back is said to be wobbling, and that wobbling is thought to be caused by the gravitational field of a planet. Characteristics of the star's wobble tell us the size and shape of a planet's orbit, the length of its year and, with some uncertainty, the mass of the planet.

The guessing starts with 51 Pegasi B, the first of the new planets to be found orbiting a Sun-like star. Paul Butler of San Francisco State University, who helped confirm the discovery of this object, called it "an extremely bizarre planet" in a recent lecture. To get more specifics, I visited Jonathan Lunine's office in the



A star (yellow) and a planet (red) orbit a common center of gravity like two skaters facing each other and holding hands as they turn. The centers of gravity in each level of the illustration are connected by the green line. At the top, the star is coming toward the viewer; in the third level, it is moving away. This motion, or "wobble," changes the wavelengths of light reaching the observer. The wobble may indicate a planet is present.

Lunar and Planetary Laboratory (LPL) at the University of Arizona. A globe of Venus stood on his desk and cryptic notes, written in felt pen, decorated the "grayboard" on the wall. The young planetologist was just finishing writing his new book on Earth, but he was really excited about 51 Pegasi B. What is it like? He held a page-size color transparency up to the light: on it were cross sections showing the interiors of Earth, Jupiter, 51 Pegasi B "Case A" and 51 Pegasi B "Case B," all calculated from theory. Case A refers to the possibility, preferred by most experts, that 51 Pegasi B is a gaseous planet. Proximity to its sun swells the gases, making 51 Pegasi B half-again as wide as Jupiter, although it has probably less than half of Jupiter's mass. Case B represents the possibility that 51 Pegasi B is a rocky planet, a kind of overgrown Mercury or Earth. If so, the planet is only about four Earths wide, but "hotter than hell," Lunine says.

In the "Fifth Floor Interaction Area" at the LPL, a wide space in the hallway furnished with a long table and swivel chairs and boasting a commanding view of the Santa Catalina Mountains, I attended the weekly meeting of professors, postdocs and graduate students working on theories of the new planets and related objects. They passed graphs and diagrams back and forth and expounded on their latest calculations. When they got around to 51 Pegasi B, it seemed as though everyone was talking at once. Bill Hubbard, the close-cropped, grizzled veteran of the group, said it may be an extreme Uranus, with a big,

SALLY BENSUSEN

rocky interior and a thin surrounding atmosphere. Adam Burrows, an internationally known physicist, chimed in with the observation that if the surface of 51 Pegasi B is rocky, then due to the high heat, it might be so soft that impact craters, like those that pockmark the surface of Mercury and the Moon, would be erased, smoothed out like the dent made on your hot oatmeal by a lump of brown sugar. Lunine suggested that there might be pools of molten metal, too. Its sun, seen from the planet, would look 20 times wider, or 400 times larger in area, than our sun viewed from Earth—or about as big as the bowl of the Big Dipper. Moreover, that planet's sun never sets; the same side of the planet always faces the star. A nice place to think about, but a visit is not to be recommended.

Actually, the very existence of 51 Pegasi B and other star-hugging planets has been questioned. David Gray of the University of Western Ontario contends that the star 51 Pegasi is rocking on its own and is not under the influence of a planet. So far, he is still in the minority in this view. Just to complicate matters further, some astronomers believe the "planets" in highly eccentric orbits are not planets at all but objects intermediate between stars and planets, known as brown dwarfs. These look like planets on the outside but are actually failed stars, without a planet's rocky core.

A few scientists remain cautious regarding the nature of any of these newly discovered companions, particularly the rush to stamp them as "planets." When asked about the new planets earlier this year, David Black, director of the Lunar and Planetary Institute in Houston and a longtime proponent of searching for other planetary systems, nonetheless responded: "What new planets?"

The astronomers who do believe are not only speculating or theorizing about what the planets look like, but some are even expressing their ideas through the graphic arts. William Hartmann (SMITHSONIAN, September 1982) has painted planets flung out of solar systems (p. 79) and underwater scenes on alien worlds (p. 80). Seth Shostak, whom I also visited,

It's children's artwork sent to astronomers. These kids may not have the advanced knowledge of the professors, but their imaginations roam even farther.

GERRY GROPP

employs trick photography and what he calls "smoke and mirrors" to create images such as that on pp. 72-73.

In his office at the University of California at Berkeley, Geoffrey Marcy, a professor at San Francisco State University and the leader of the team that, so far, has made the most discoveries of new planets, shows me an unexpected source of speculation on what these giant worlds look like. It's artwork from children, sent to the astronomers by their schoolteachers. These kids don't have the advanced knowledge of the professors in the Fifth Floor Interaction Area, but their imaginations roam even farther. In this new genre, one picture shows a planet with what appear to be continents and oceans, rings and at least three moons. Another drawing features two planets with possibly unique features against a background of yellow stars with red centers (left).

The biggest controversy is not over what the new planets look like but how they got where they are. For 47 Ursae Majoris B, a planet orbiting a star in the Big Dipper, there's no special dispute. "This planet, if plunked down in our solar system, would look like Jupiter, but a little closer in," Marcy said. It follows a circular orbit, rounding its sun once every three Earth years. But how did huge planets like 51 Pegasi B, 55 Cancri B, Tau Boötis B and Upsilon Andromedae B get into their star-hugging orbits, each closer to its sun than Mercury is to ours? And what might have thrown the eccentrics into highly elliptical orbits so unlike those we see in the Solar System?

There are at least six theories of how these giant planets came to be where they are and in the orbits they're in: I'll deal with two of the major ones here. The first I call the "tidal parade," which attempts to explain the star-hugging giants. The second, termed by one of its originators the "jumping Jupiters" theory, aims to explain the eccentrics.

According to the tidal parade theory, newborn solar systems are vulnerable to a kind of stellar cannibalism, in which the central star may swallow some or all of its baby planets. The elaborate theory was explained to me over wine and a

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fine French meal by its originator, theoretical astrophysicist Douglas Lin of the University of California at Santa Cruz. This took about three hours, so I will summarize.

Conventional theory says giant planets cannot form close to stars. The reasoning, in part, is this: planets are born in what are known as accretion disks—flattened clouds of gas and dust particles surrounding newborn stars. (Telescopic observations show that such disks are commonly present around young stars.) Near the center of a disk there is less matter from which large planets could form, simply because there is less room: the area around the center of a circle is smaller than the area farther out. Most of the gas and dust lies in the far reaches of the disk.

But, according to Lin, planets don't necessarily need to form near the center for them to end up there. What is at first a smooth disk, revolving around the star, soon develops structure, as matter clumps together to form planetesimals, the building blocks of planets. The planetesimals collide, some getting bigger to become full-fledged planets. A big planet, by virtue of its strong gravity, pulls in much of the nearby matter in the disk, and a gap forms, like the blank space on a record between two separate musical selections. Now the disk is in two parts: the inner disk, located between the giant planet and the central star, and the outer disk, well beyond the planet's orbit. The planet, and every particle in each of the disks, is orbiting the star. The closer to the star, the faster things orbit, just as Mercury, our innermost planet, orbits faster than the next planet, Venus, which orbits faster than Earth. The big planet's gravity tugs on the faster-moving, inner accretion disk, causing it to lose momentum and fall inward, so that it eventually falls into the star. Now it's the planet's turn; the gravitational tug of the slower-moving, outer disk retards the planet so it, too, loses energy and spirals inward toward the star.

In some cases, Lin thinks, the planet suffers the same fate as the inner disk, and is swallowed whole. In other cases—for instance, if the outer disk dissipates in time—the orbit stabilizes, leaving the planet very close to the star. As a practical matter, Lin thinks, many planets may form in the same solar system. Any of those that started out interior to the big one just spiraled into the star along with the inner disk. This may have happened in our solar system long ago, Lin told me: Earth "may have had many cousins that demised in the early formation process."

Now, about "jumping Jupiters." That term was a code name used privately for a more conservatively titled paper by Stuart Weidenschilling and a colleague. I was briefed on this over Mexican food by Weidenschilling, a theoretical astronomer at the Planetary Science Institute in Tucson. The theory goes something like this: when those planetesimals are flying around the accretion disk, bumping into each other and occasionally forming planets, things are chaotic. Even large planets formed this way can collide, or at least come close, which is a pretty violent event, given their powerful gravity. These close encounters can literally knock a planet for a loop. If there are only two big planets, things aren't too bad. But, as Weidenschilling put it, "as soon as you have three or more, you have multiple encounters. In one configuration, the orbits can change radically: one planet is thrown out of the system . . . and the other two are thrown into very different, elliptical orbits, one in close to the star and one well out."

One point that experts emphasized over and over is that the planets found thus far may be just the tip of the iceberg.

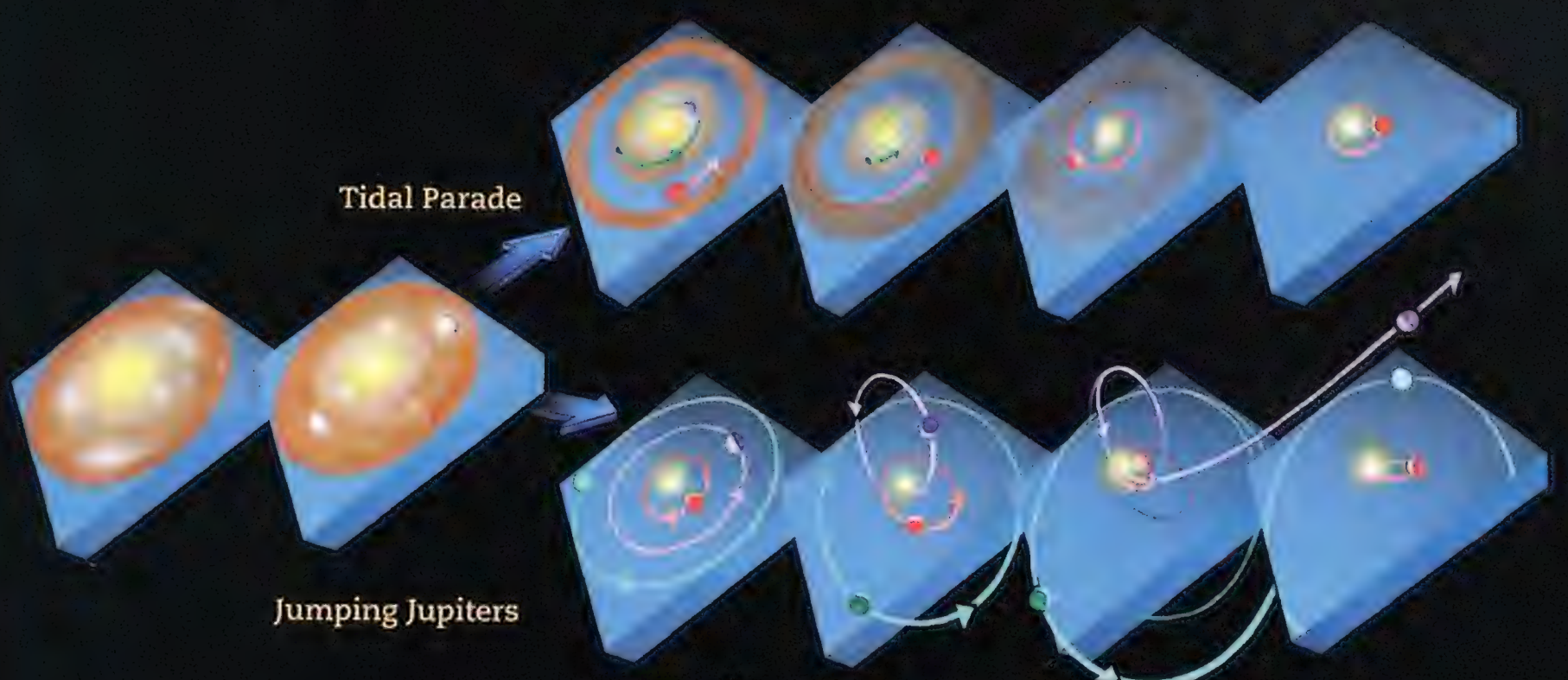
Weidenschilling's "jumping Jupiters" theory readily explains the eccentrics, the newfound giant planets that are in highly elliptical orbits. A corollary is that there are giant planets that have been thrown out of solar systems into the cold of interstellar space, a phenomenon that we may not be able to verify, unless one unfortunately comes our way. Weidenschilling also predicts that any solar systems formed in this way each have an eccentric and another giant planet in a distant orbit.

One point that experts I visited emphasized over and over is that the planets found thus far may be just the tip of the iceberg, because the primary method used to discover them is most sensitive to detecting massive planets in orbits close to their stars. "What we're seeing so far is purely a selection effect," said Gibor Basri, an astronomy professor at the University of California, Berkeley. "Any system in which you don't have a giant planet close to the star is still hiding."

It is this vista of untold planets around us in the Galaxy that elates the practitioners of SETI, the Search for Extraterrestrial Intelligence. Presumably only a fraction of planets may be accompanied by life, on them or on their moons, and in only a fraction of this fraction has the life evolved to a state where it operates long-distance communications technology. Nevertheless, the planet discoveries, says Frank Drake of the SETI Institute in Mountain View, California, "tell us we've been on the right track all of these years." His associate Seth Shostak, the astronomer and trick photographer mentioned earlier, maintains that "the planets are probably within an order of magnitude a regular accompaniment of stars." In techspeak, that means he thinks about one in ten stars may have planets. And as Sagan famously said, there are billions and billions of stars out there.

OPPOSITE TOP, SALLY BENSUSEN; WILLIAM K. HARTMANN

How Odd Orbits Evolved



In the first two panels above, planets take shape in the gas and dust around a new star. Next are sketches of two theories of why the "new" planets have unusual orbits. In the "tidal parade" small inner planets, slowed by a large one farther out, fall into the star. The large planet is slowed by an outer disk, causing it to spiral in. When the disk dissipates, the planet stabilizes in an orbit very close to its star. "Jumping Jupiters" occurs when at least three planets form in orbits that allow two or more to come close together. One may end up in a highly elliptical orbit; another may be thrown into space—in the picture at left, just that has happened to a planet and its moon, upper left. The bright area at right is a star-forming region.

> *"I think there's a good chance we'll detect life outside the Solar System in our lifetime."*

Last fall, the SETI Institute moved its alien-broadcast listening gear to the 140-foot radio telescope at the National Radio Astronomy Observatory in Green Bank, West Virginia, where Drake had made the first primitive SETI search with a smaller telescope in 1960. They installed their new FUDD, the Follow-Up Detection Device, a few hundred miles away to guard against being misled by signals arising near the Green Bank site. The improvements in search methods since 1960 are truly "astronomical." "We are 200 trillion times faster and more sensitive today than Frank was then," says project director Jill Tarter. All of the planets found by Marcy, Butler and others are on the observing list. No detections have been reported thus far, but Drake and Tarter are not the only ones listening. Other SETI searches that are currently under way include Project BETA, the superpowerful successor to META, at Harvard University; Berkeley's SERENDIP IV at the newly upgraded 1,000-foot bowl antenna at Arecibo, Puerto Rico; and Project Argus, which uses multiple amateur satellite receiving dishes scattered across the country and abroad. "I think there's a good chance we'll detect life outside the Solar System in our lifetime," Drake says.

At a lecture Geoffrey Marcy gave last year in Berkeley, some of the undergraduates sitting in the back, near me, were leafing through the college newspaper, swinging their legs back and forth, and in one case, apparently catching up on some much needed sleep. But when Marcy projected an artist's concept of 51 Pegasi B, so close to its sun that he said it "looks like the star is about to swallow the planet," they put down the papers, squinted through sleepy eyes at the fanciful space painting and started to pay attention. So has nearly every astronomer in the world.

Space scientist Stephen Maran's latest book is Gems of Hubble, *written with British astronomer Jacqueline Mitton.*

Jellyfish-like organisms are imagined floating in the warm water around a thermal vent under the ocean of an alien world.

WILLIAM K. HARTMANN

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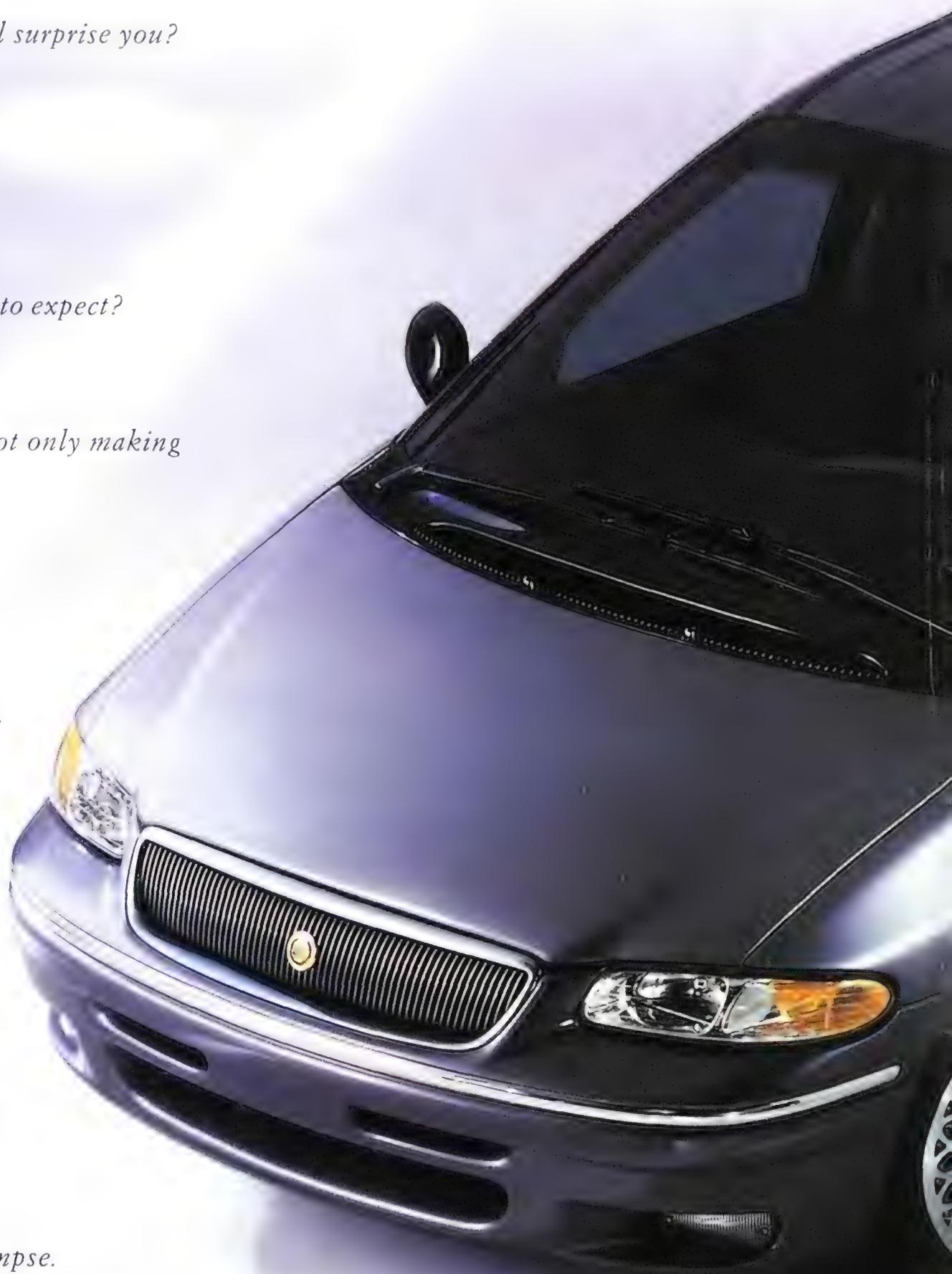

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It all comes out in the wash

BY CHIORI SANTIAGO

THIS IS A GOOD PLACE TO BE IN A BAD MOOD. THE reason for my grumpiness is a couple of weeks' worth of dirty clothes stuffed into two shopping bags. I couldn't face an afternoon at the laundromat on the corner, a purgatory of leaky machines, petroleum-strength coffee and dog-eared copies of auto-repair journals. So, on a friend's suggestion, I've hauled my bags across the bay to the Brain Wash, a different kind of laundromat in San Francisco. I can tell at a glance that this is not the washhouse of my mother's day, where entertainment meant staring at the clothes tumbling in the dryer, and my spirits have revved up like a washer on spin cycle.

Sure, the change machine balked at my dollar bills, spitting them back as if sticking out its tongue. And I've forgotten to bring soap. But the young woman behind the counter sells me a 40-cent scoop of house detergent from a huge container and congratulates me for having bought "bulk" ("Much better for the environment," she explains). Before long my dirty clothes are sloshing away, and I stroll across the floor to the Brain Wash Cafe, where I can buy a latte and settle down with a copy of the free neighborhood weekly. A few minutes later, a musician wedges himself into the strip of space between the roomful of washers and the coffee bar, plugs in

Doing the laundry is easier than in the days of this washboard or even the '57 designer-pink machine opposite, but it's still a chore.

his microphone and launches into loud, earnest lyrics accompanied by the bass thrum of dryer cylinders and the soprano whir of gyrating washers.

By the time I stuff my clothes into one of the big dryers, I'm dancing across the concrete floor and wishing I had more dirty clothes. I'm even willing to do someone else's wash just to hang out a while longer. I've discovered a subculture that unites a spectrum of humanity, from the guy with the shaved head who's folding an entire wardrobe of black clothes to the mother of three who's commandeered a couple of "big whopper" machines.

Once, colleges furnished students with special boxes for shipping laundry home to Mom. Today, with Mom at work and the kids doing their own wash, laundromats are becoming a watering hole in every sense—part nightclub, part meeting place. The Bobs, a popular a cappella group, celebrate the possibilities in their five-song "Laundry Cycle." "I've never washed clothes with a strange man before," they croon in "Share a Load"; "But what the hell, let's try it!"

In the song, a couple starts out sharing a load and the next thing they know, their garments are cohabiting. In Travelers Rest, South Carolina, Annie Ables hosted a wedding in her laundromat for two patrons who met while folding clothes. The bride "marched from the back between the washers and dryers," Ables told the *Wall Street Journal*. "It was beautiful." At Stan Klein's Rock & Fold in Chicago customers are treated to neon lights, movies on five screens and gospel music pouring from overhead speakers. "People seem to want something spiritual when they're doing laundry," Klein explains.

On the home front, too, the chore of doing laundry has undergone a major transformation. Washing machines, once one of the great luxuries of the postwar era, are one of the few commodities that cost less today than a generation ago. In 1947, when many families didn't own a toaster, let alone a washing machine, the average washer cost $240, or about $1,770 in today's dollars. For a present-day family, the price of a washer is about $380. Americans wash a whopping 200 billion pounds of laundry every year, and manufacturers of detergents, stain removers, and washers and dryers spend huge sums to get their products to that insatiable market.

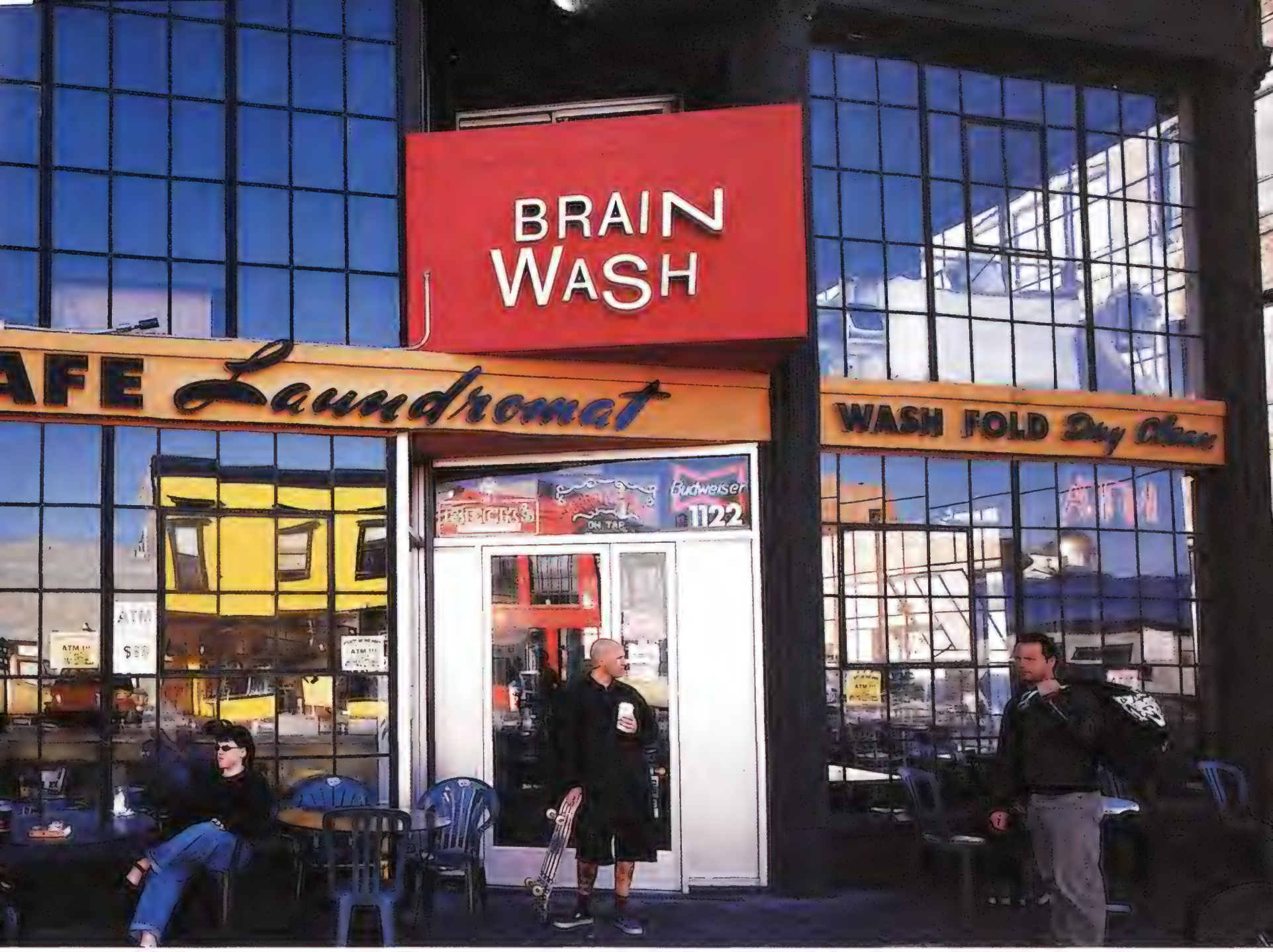
Still, in many parts of the world, the laundry is done as it has been for at least 4,000 years: people haul their baskets to the nearest river, pound the clothes clean on the rocks, and spread them in the sun to bleach and dry. Perhaps the oldest known records of washday are those that appear in the wall paintings in Egyptian tombs dating from around 2000 B.C. One of them depicts men bending over the wash, two scrubbing the fabric, two folding, while two more twist the fabric to dry it.

According to Pliny the Elder (SMITHSONIAN, November 1995), a washday miracle occurred in 600 B.C. when the Phoenicians mixed goat's tallow and wood ashes, creating soap. They had discovered the advantage of a surfactant—a substance that reduces the surface tension of water, enabling it to better penetrate fabric, loosen dirt and hold that dirt in suspension until it's rinsed away.

Humankind now had the three ingredients for a good, clean wash: water, agitation and surfactant. Here's how washing basically works. Let's say you're out gardening in your backyard, and at the end of the day you're wearing one grimy T-shirt. The dirt, if you could see it through a microscope, clings to the fibers in your cotton shirt the way trailside burrs stick to your socks. You can turn the hose on your T-shirt and get it fairly clean, because the onrush of the water will loosen the grip of many of the dirt particles and carry them away.

Most body oils, though, repel water molecules. To get rid of that yellow ring around the neckband, you need to rub it with surfactant (you'll find it in your bathroom disguised as a bar of soap). Surfactant compounds are made up of molecules that act like microscopic magnets. One end of the "magnet" attracts dirt; the other end is attracted to water (these

P. 84 GRANGER COLLECTION; P. 85 BROWN BROTHERS



At the Brain Wash in San Francisco, patrons can grab a bite or listen to live music and poetry readings while juggling loads. The trend toward hip, multiservice laundromats is spreading.

compounds are produced by mixing animal fat with lye from wood ashes, a formula used by the Celts when they made their *saipo*, from which the word "soap" is derived). The dirt-loving end gloms on to body oil, and the water-loving end loosens the oil from the cotton fibers, keeping it suspended. Add a little elbow grease, and the dirt washes away.

In other words, if you have ready access to running water and your wardrobe is minimal, laundry isn't a big deal. Mariners of old had a nonchalant approach: they stuffed their dirty doublets in a bag, fastened it with rope to the ship and tossed the bag overboard, letting the sea agitate the load as they sailed. Sir John Hoskins borrowed the idea in 1677, when he tied linens in a bag and used a wheel-and-cylinder device to squeeze water through it in the first recorded clothes-washing mechanism. The more common method involved tubs of water (often cold) and plenty of elbow grease. Hot water is more effective—the heat helps dissolve oil and grease—but fuel was precious.

Where wardrobes expanded, so did the laundry. English estates of the 17th and 18th centuries refined it to an art. Prosperous households could devote substantial space to such amenities as bleach houses, hot-air closets and rooms devoted to ironing and folding. Batteries of servants did the hot, dangerous work of boiling laundry in copper tubs, stirring it with wood "scrubbing sticks" and then flattening everything between the rollers of a mangle, which could crush fingers, even whole limbs, in an inattentive second.

In Colonial America, tackling the wash was such an arduous process that some households did it only four times a year. One letter from 1760 notes that "Grandmother Blum is so deep in her Quarterly wash this Weeke that she has no time only to send her love." The labor-saver of this generation was a "pounder," a pole capped by a block of wood drilled with holes. Moved up and down in a "pounding barrel," the device suctioned water through the clothes, anticipating the action of the modern washing machine. By the next generation, wooden washboards were widespread.

Wet clothes were spread on the ground or draped over a bush to dry, until the clothesline became widely available in the 19th century, and with it a technological marvel, the clothespin. The early friction types of these fasteners were whittled in dozens of variations, from the knob-top versions

to the simple pincers still in use today. Between 1852 and 1887 alone, about 150 clothespin models were patented; a collection of 41 of them is housed in the Smithsonian's National Museum of American History. "They're mostly variations on the 'friction fit and spring fit' and come from New England and the Midwest, where there's a tradition of men sitting around whittling," says museum specialist Barbara Janssen.

The best laborsaving device, though, was the laundress. "Get a woman, a woman, a good washerwoman . . . you'll never regret it, you'll never despair." So ran the version of "The Irish Washerwoman" that I sang as a child. Laundry was the territory of women, and particularly of indentured or immigrant women, and "taking in wash" was a respectable way for a single woman to support herself.

The first commercial laundry opened in Troy, New York—home of the detachable shirt collar—in 1837. The idea really caught on a decade later when a dearth of laundresses during the California gold rush of 1849 forced some miners to send their dirty togs to Chinese laundries in Hawaii for cleaning. Before long, the Chinese arrived to do the job in person. In 1851, the first known Chinese laundry was set up in San Francisco; by the 1880s, Chinese-Americans owned and operated more than 75 percent of Northern California's laundries.

No matter who did the laundry, it remained a job for the underprivileged. California novelist Jack London, writing early in this century, makes laundry a vivid symbol of working-class woe in *Martin Eden* (1909), the story of a poor but ambitious writer that parallels London's own life. To support his writing, Martin takes a job in a hotel laundry. "The echoing chamber of his soul was a narrow room," London wrote, "whence were directed his arm and shoulder muscles, his ten nimble fingers, and the swift-moving iron along its steaming path . . . rushing along interminable sleeves, sides, backs, and tails, and tossing the finished shirts, without rumpling, upon the receiving frame. And even as his hurrying soul tossed, it was reaching for another shirt. This went on, hour after hour. . . ."

It's no surprise that London chose laundry as Martin's occupation in this tale of strife. It was a nearly insurmountable task, although the domestic science movement—at its peak from the Victorian era through the Roaring Twenties—tried to tame it. A typical Victorian almanac listed dozens of "receipts" for eradicating grease spots, port wine stains and rust marks from irons. The well-informed housewife was expected to work with chloride of lime, Glauber's salt, muriatic acid and many other chemical compounds.

Typically, a week's housework began with the wash. "They that wash on Monday / Have all the week to dry," urged an old rhyme; "They that wash on Tuesday / Are not so much awry; / . . . They that wash on Friday / Wash in need; / And they that wash on Saturday, / Oh! they're sluts

ROBB KENDRICK/AURORA; WOLFGANG KAEHLER/GAMMA LIAISON; JOANNA B. PINNEO/AURORA

Gathering at the River

In many parts of the world, the wash is done, as it has been for centuries, in the nearest river or lake. From left: A stream near Pangboche, Nepal; along the bank of the Bani River in Mali; and Lake Bratan near Bedugul in Bali.

indeed." Home economists of the 1890s developed meal plans around the washing schedule: a menu published in a ladies' magazine in 1894 recommended a hearty meal of spareribs on Monday to fortify a tired housewife, while the formidable cookbook author Mary J. Lincoln suggested baked-bean soup, toast and stewed raisins for supper on Tuesday (the day set aside for ironing) so as not to "scent the clean clothes with the odor of onions or frying."

For those of us who never had to consult Mary Lincoln's books, it's difficult to imagine the freedom that the first washing machine represented. The copper boiler was gradually replaced by a newfangled device that "works at one task, doing it well, while the housekeeper does something else," according to a laundry manual from the 1920s. Washers came in an amazing variety. They agitated by way of revolving dashers, oscillating boxes, suction cups and perforated cylinders. By 1939, they were sold under such trade names as "Master" and "Commander," suggesting there was nothing they couldn't handle.

As technology marched in, the quaint habits of an era slipped away. Gradually, laundry chores moved indoors, and flapping wash became a symbol of folks too poor to own a dryer. "I wish I could hang my laundry in the backyard," laments Laine Wilder, cofounder of Ecomat, an environmentally sensitive clothes cleaners and laundromat franchiser in New York. "But the neighbors would think it's tacky."

No wonder—when I was growing up, backyard laundry was a neighborhood semaphore, full of revelations. One glance at a clothesline told you whether the new kid down the street was a girl with ruffled dresses or a boy who wore out his pants at the knees. The sail-size knickers of the crotchety lady next door were a constant source of amusement. Our own backyard had a long clothesline strung on pulleys. It ran conveniently past our tree house, so if you stood on the back porch, you could clothespin a note to the line and reel it out to a buddy in the tree house. Sometimes I think it's too bad my children won't know some of those old-fashioned pleasures, like running through a fragrant line of sheets snapping in a June breeze.

And ironically, although "modern conveniences" made life cleaner, they didn't necessarily make the chores go faster, at least not at first. "During the middle of the 20th century," reported *American Demographics* magazine recently, "American women gained access to a vast array of new technology that made it possible for them to theoretically save a lot of time on housework. But since many were homemakers whose identities were directly related to the home, they apparently opted to spend as much time cleaning, but to do it more thoroughly. We may never be able to prove it, but the true cleanliness of American homes may have reached a zenith in the 1950s and 1960s." With the economy growing rapidly, and women being pressured to stay at home, the

At a busy riverside washing business near Abidjan, Ivory Coast (left), old truck tires anchored by large rocks serve as laundry stations for the crush of workers. Above: A less chaotic washday on the Mekong River in Laos.

In the 1920s and '30s, rural women strapped with endless wash—such as the Tennessee pair above—were the target of magazine ads for washing machines like the one at right.

work apparently expanded to fill the time.

Maytag evoked that era with true genius in March, during the unveiling of its newest washer—a water-saving, front-loading model inspired by the old perforated-cylinder technology. A pantheon of TV moms ("Celebrity Ghosts of Laundry Loads Past") assembled on the stage of Lincoln Center in New York, each with her own washer. "After Ward got me Maytag's first automatic washer . . . I had more time to prepare my famous Jell-O molds," chirped Beaver's mom, a somewhat older Barbara Billingsley, standing beside her '50s-era white machine. "What Lassie was to Timmy, my Maytag was to me," added June Lockhart, dressed in her trademark apron. Then, patting her "Pasteltone Pink" machine, she cooed, "Ooooh, good girl."

Hand in glove with washer and dryer manufacturers strode developers of "new and improved" detergents and stain removers. If the water that comes out of your tap is "soft"—containing few or no minerals—you won't need a detergent. But chances are your tap water is "hard," with dissolved mineral deposits, and those deposits turn soap lather into curd that holds on to soil instead of releasing it. It's the same scum you find on the tiles and fixtures in your shower. For this condition, detergent was invented.

Detergent formulas replace the fat and lye used in soap with compounds synthesized from crude oil or other fat substitutes. The formulas are usually "built" with water softeners such as phosphates. Some detergents also contain additives such as enzymes, perfume and bleach.

In the 1970s, environmentalists led a movement to eliminate phosphates from detergents. These substances, says Lyn Taylor of the Ecology Center in Berkeley, California, made algae grow so quickly in waterways that entire fish populations were wiped out. U.S. detergent makers removed phosphates four years ago, replacing them with somewhat more benign builders, according to the Soap and Detergent Association. Even so, you wouldn't want to pour your soap- or detergent-laden wash water into a pristine stream; its ingredients could upset delicate microenvironments.

Procter & Gamble built an empire on Tide, the first phosphate-built detergent to appear on American grocery shelves, in 1946. The company devised a novel advertising scheme featuring serial tales of harried housewives. Early print ads followed the lives of the Jollyco family, users of Ivory soap; those led to radio shows. "Ma Perkins," a weekly radio show introduced in 1933, was one of the first "washboard weepers," and featured 15 minutes of potboiler plot sandwiched between Oxydol "slice-of-life" commercials (Husband: "Gosh dear, a smile on your face on washday? Where's that old backache?" Wife: "I found a new soap called Oxydol. No more backaches for me, dear"). By the time the show was canceled in 1956, it had ushered in a new entertainment genre, the soap opera.

The domestic goddess faded from view in the 1970s, replaced by women who worked full-time jobs outside the home and who demanded products that got the chores done with speed, and with less damage to the environment. Heeding the call, research laboratories press on in their unrelenting search for new and improved laundry products.

To find out what we can expect in the next wave of washday aids, I visit a couple of research labs. My first stop is the Center for Advanced Research in Biotechnology (CARB) in Rockville, Maryland.

Here, Phil Bryan, Travis Gallagher and Gary Gilliland used genetic engineering to improve an enzyme called subtilisin that can literally eat the sweat right out of your socks. "This molecule is recruited out of nature and put in the washing machine," Bryan explains in his office. In one hand he twirls a model of the enzyme; it is fashioned of colored wire, and it loops and spirals like a free-form mobile. "The job of this enzyme is to eat protein. It's produced by bacte-

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ria that live in soil; it oozes into the soil and eats proteins in dirt as part of the rotting process."

Beginning in 1967, manufacturers added enzymes to laundry detergents; the idea was that they would feast on difficult protein-based stains such as milk, grass and blood. It was a good idea, says Bryan, but it wasn't very effective. "The main shortcoming was that, in order to work, the enzyme has to maintain its shape. For this, nature gives it a calcium atom." But hot water, bleach and water softeners slowly suck the calcium out of the subtilisin molecule. "It just falls apart—like pulling out the cornerstone of a building," he adds.

"For everything you wash yourself," read a 1920s British ad for Lux.

For three years, the team scrutinized the subtilisin molecule. "When we figured out the calcium atom was on this little loop in the molecule, it seemed elegant to just go in, snip the loop and rebuild the calcium site," Bryan says, scissoring his fingers over a section of the wire model. By generating mutations of the snipped subtilisin, the team altered the DNA chain to create a tougher strain of the enzyme that wasn't dependent on the calcium to hold its shape. Listening to the scientists, I had sci-fi visions of mutated enzymes running amok in city sewers, gobbling up everything in sight. Bryan and Gallagher explain that their version of subtilisin is made to exist in a particular environment—hot, soapy water—and won't last long once it's down the drain.

Also on the cutting edge of laundry research is Kay Obendorf, a professor of textiles and apparel at Cornell University; for years detergent makers have relied on her research in the development of new laundry products. She greets me in her office in Ithaca, New York, as the winter's first snow drops a blinding white blanket over the city.

In 1978, Obendorf began tagging certain human body oils—squalene, triolein and oleic acid—with a "chemical beacon" that would allow her to pinpoint with an electron microscope where the oils collected in clothing. She shows me an electron image of a cross section of soiled cotton such as you might find on a T-shirt you've been hiking in. All I can think of, with a slight shudder, is macaroni and cheese: the elbow-shaped cotton fibers seem to be floating in a thick white goo. "That's the body oil," she says cheerily. The polyester-cotton sample is worse; the fibers look as if they've been dipped in a vat of Crisco. "Polyester traps the oils in interfiber capillaries," Obendorf explains. "It's really a difficult fiber to get clean."

Bleach helps to remove dirt from white fabrics, but mostly it simply turns stains colorless. If you've ever stored your freshly washed summer whites in September and were shocked to find them yellow when you unpacked them in May, you've seen the effects of squalene left in apparently clean clothing. What's happened is a process Obendorf calls auto-oxidation or "aging." If you threw your grubby T-shirt in your backpack instead of washing it, residual oils would begin to create a chemical bond with the cellulose in the fabric. The resulting compound is similar to that used in textile dyes; and the longer it ages, the harder it is to remove.

Each type of stain requires a different cleaner. Remember those soil-eating enzymes? One of them, a common detergent additive, is protease, which Obendorf says is very effective on protein-based stains such as Hollandaise sauce. But a protease product is not well suited for silk or wool, because the substance can weaken these natural protein fibers. Amylase, another common additive, works on starches—dried baby food, gravys or cereal. Lipase breaks up the fatty compounds in oily stains. Finally, detergents that are boosted with cellulase open up cotton fibers to get at those stored clumps of body oil that look so alarming under a microscope.

Obendorf says the biggest new laundry development will be equipment that saves significant amounts of water and energy. The horizontal-axis washer that Maytag introduced in March with help from the TV-celebrity housewives, and a similar model by Whirlpool, fall into this category.

I've saved my biggest question for last. Why, I ask Obendorf, has she devoted a 20-year career to laundry when most women try to avoid the subject? "Laundry is an extremely complex system," she tells me. She realized this the day she washed five loads just to clean the accoutrements worn by her son during a single soccer game. She had to contend with the team colors, red and white—snappy shades on the field that, if washed together in the wrong water temperature, can turn the whites pink. There was the problem of separating thin polyester jerseys and heavy cotton socks, mud-caked shin covers and unsoiled but sweaty undershirts. "Those of us who do the laundry don't get enough credit for the technical decisions we make every day," Obendorf says. "Some very serious science goes into doing the laundry."

Chiori Santiago, a frequent contributor, is a freelance writer from Berkeley, California. She wrote about tap dancing in May.

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Pluk. phytogr. Tab. 68 fig 4

Mark Catesby

Both Audubon and Linnaeus were indebted to this intrepid British limner of the New World ◆ **BY DOUG STEWART**

WHEN JOHN JAMES AUDUBON, THE CELEBRATED American naturalist, set off on a painting expedition to South Carolina in 1831, his entourage included a full-time background painter and a taxidermist. A century before, when a little-known British painter and naturalist named Mark Catesby tromped through the swamps and woodlands of the same state, he did so the hard way. Catesby hiked hundreds of miles, mostly alone, fighting off illness and infection, and eluding warring Indians, all the while producing delicate and brilliantly colored watercolors of wildlife unknown to Europeans. Lacking any other means of preserving the small snakes and insects that he shipped home to eager collectors in England, Catesby packed them in widemouthed jars filled with rum. As if the other hurdles he faced were not enough, a new obstacle presented itself on the voyage home: thirsty British sailors. The crewmen on the merchant ships sometimes raided Catesby's carefully packed specimen cases and, unfazed by the steeping creatures, drank the rum dry.

A less persevering individual might have given up and turned to gardening, but Mark Catesby persisted. During two extended trips to America between 1712 and 1726, Catesby produced detailed paintings and notes while at the same time shipping a steady flow of dried plants, seeds and animal specimens to his patrons in England. In so doing, Catesby laid the groundwork for his masterpiece, *The Natural History of Carolina, Florida and the Bahama Islands*.

The enormous, two-volume book was the first illustrated flora and fauna of North America's wildlife and one of the outstanding achievements of 18th-century natural science. In 1747, Cromwell Mortimer, secretary of England's prestigious Royal Society, called Catesby's newly completed opus "the most magnificent work I know since the Art of printing has been discovered." The great Swedish botanist Carolus Linnaeus (who never visited America) relied in part on Catesby's work for his revolutionary classification of species. Thomas Jefferson avidly sought a copy of *The Natural History*, and Lewis and Clark consulted it before heading overland toward the Pacific. Yet in the 250 years since Mortimer's enthusiastic appraisal, Mark Catesby's work has fallen into obscurity, eclipsed, like that of the later, American ornithologist-artist Alexander Wilson, by the unrivaled brilliance of Audubon.

Opposite: A blue grosbeak feeding on sweet bay seeds is typical of the watercolors; the size is 11 by 15 inches. Above: A red hind, found in Bahamian shallows.

A Virginia host reported being dragged by Catesby into a nearby swamp.

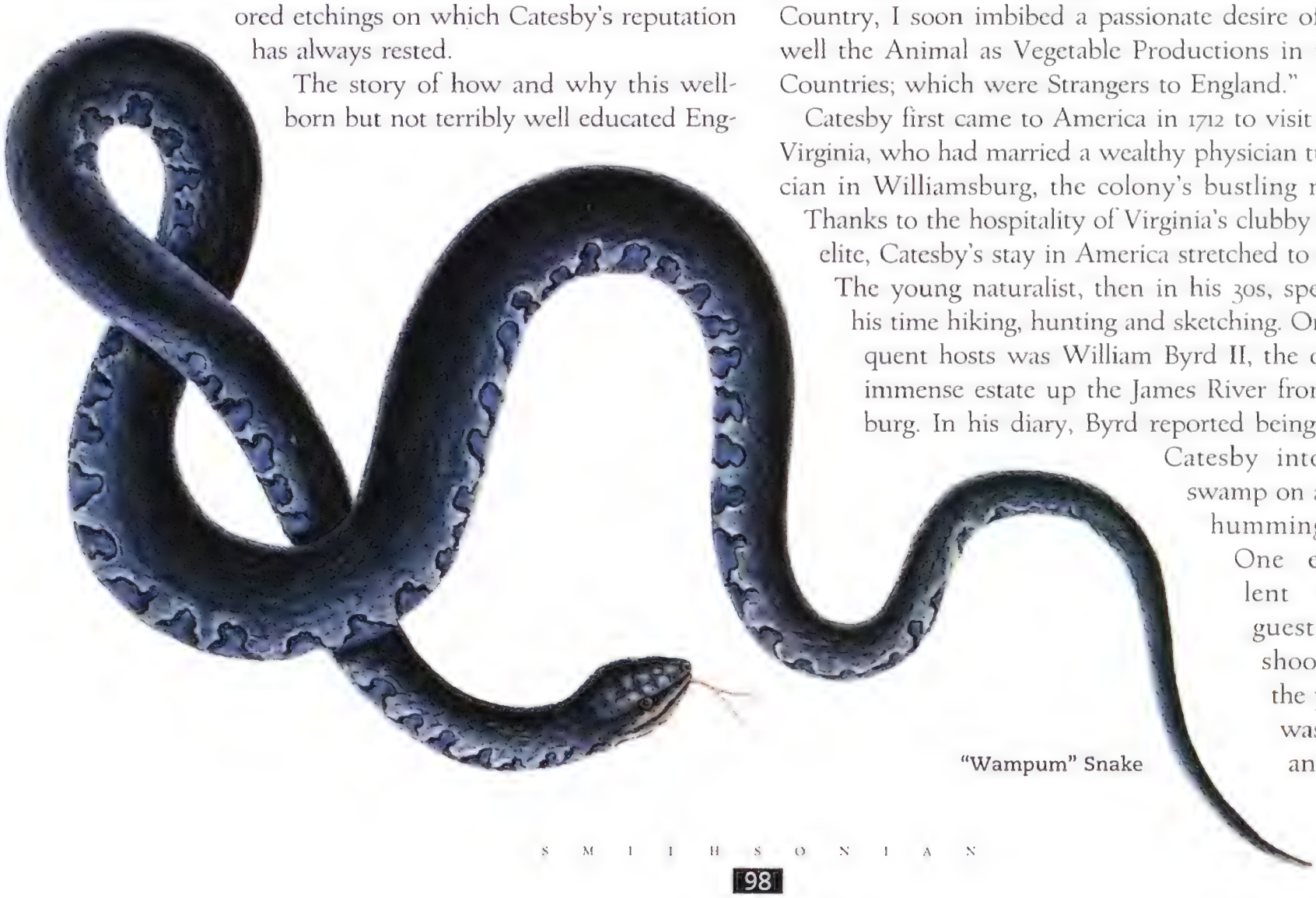
Now a new touring exhibition, accompanied by a flurry of publications, seeks to restore the luster to Catesby's reputation as not only America's first ornithologist but also an artist of uncommon ability. "Mark Catesby's *Natural History* of America: The Watercolors from the Royal Library, Windsor Castle," sponsored nationally by British Airways, opened in May at the Huntington Library, Art Collections and Botanical Gardens in California. It is currently at Houston's Museum of Fine Arts (through November 9), then goes to Colonial Williamsburg's DeWitt Wallace Gallery (November 20 to February 16, 1998) and the Telfair Museum of Art in Savannah, Georgia (March 3 to May 10, 1998), and ends at the Queen's Gallery, London (fall 1998).

The exhibition provides the first public view of a broad selection of the watercolors that Catesby painted in America. These works have been the property of the British crown since 1768, some 20 years after Catesby's death, when the young King George III, a natural-history buff, bought them for the then princely sum of £120. Bound between covers, the 263 watercolors stood on a shelf, first in Buckingham House (now Buckingham Palace) and later in the Royal Library at Windsor, for more than two centuries, virtually unknown and unseen even by Catesby's modern biographers. Much more than simple field sketches, the near-life-size paintings—often elegantly composed, sometimes naively charming—are richer and more detailed than the hand-colored etchings on which Catesby's reputation has always rested.

The story of how and why this well-born but not terribly well educated Englishman became a pioneer of scientific illustration is hard to trace. Mark Catesby left no diary and few letters. No known portrait of him exists. Born in rural Suffolk in 1682, Catesby had a gentleman's upbringing and perhaps an art lesson or two but was largely self-trained as a naturalist. A bachelor for most of his life, he was described by a friend, not very affectionately, as "tall, meagre, hard favoured, and [with] a sullen look [and] a silent disposition." Much of what's known about Catesby's life comes from the text of his *Natural History*, which suggests a stoic, solitary man with an almost obsessive curiosity about everything from grain cultivation to the preparation of caviar. Richard Pulteney, an 18th-century historian, regarded him as "one of those men, whom a passion for natural history very early allured from the interesting pursuits of life," though Catesby would no doubt have disagreed.

The early 18th century was a time of empire building. Exotic new species were flooding into Europe from distant corners of the world, and fitting them somehow into the Creator's divine plan was a central scientific enterprise. Botany was the reigning science, and the nurturing of botanical gardens was a popular avocation of country squires, among them one of Catesby's uncles. The young man may have learned to sketch exotic plants for him. Still, Catesby recalled later, he chafed at living so far from London, "the Center of all Science": "My Curiosity was such, that not being content with contemplating the Products of my own Country, I soon imbibed a passionate desire of viewing as well the Animal as Vegetable Productions in their Native Countries; which were Strangers to England."

Catesby first came to America in 1712 to visit his sister in Virginia, who had married a wealthy physician turned politician in Williamsburg, the colony's bustling new capital. Thanks to the hospitality of Virginia's clubby landowning elite, Catesby's stay in America stretched to seven years. The young naturalist, then in his 30s, spent much of his time hiking, hunting and sketching. One of his frequent hosts was William Byrd II, the owner of an immense estate up the James River from Williamsburg. In his diary, Byrd reported being dragged by Catesby into a nearby swamp on a quest for a hummingbird nest. One evening he lent his young guest a gun to shoot a bear on the property. "It was only a cub and he sat on



"Wampum" Snake

a tree to eat grapes," Byrd wrote, amused by Catesby's excitement over a commonplace. Byrd had been sick all that day, but the diversion cheered him up, "and we were merry in the evening."

Catesby was enthralled by the American landscape, but he was not yet thinking of posterity. "I thought then so little of prosecuting a Design of the Nature of this Work," he wrote in *The Natural History*, "that in the Seven Years I resided in that Country, (I am ashamed to own it) I chiefly gratified my inclination in observing and admiring the various Productions of those Countries . . . only sending from thence some dried Specimens of Plants and some of the most Specious of them in Tubs of Earth, at the Request of some curious Friends."

An American goldfinch (above) is backed by a compelling array of locust leaves. The "wampum" snake (opposite), named for its markings, is not known to scientists today.

Catesby's second trip to America, from 1722 to 1726, was more businesslike. This time, an expanded coterie of "curious Friends" was paying him for whatever he could ship home: live plants, dried leaves, seeds, skins, dead birds immersed in ground tobacco. Catesby's sponsors came from a small, tight-knit circle of English collectors, naturalists and aristocrats, many of them members of the Royal Society. Catesby's champion was William Sherard, a wealthy and well-connected Oxford botanist. Another backer was Sir Hans Sloane, later court physician and president of the Royal Society, whose vast hoard of natural and man-made objects was to become the core of the British Museum.

On his own, Catesby was planning an illustrated book of American exotica. During his second sojourn in America, this time in the relative wilds of the Carolinas, Georgia and the Bahamas, he resolved to document as many species as possible. That he did so in hundreds of finely wrought watercolors while at the same time sending specimens and even duplicate paintings to his nearly insatiable patrons in England is astonishing. He had to beg them for extra drawing paper, specimen jars and, at one point, £20 to purchase a slave. (There's no record that the last request was ever granted.) In his letters, the strain is evident. To Sherard: "I profess before God I never *can* be more industrious in collecting whatever I could possible meet with. . . . I wish I could know what you required and by whome." To Sloane, who kept demanding more of everything, especially snakes: "My Sending Collections of plants and especially Drawings to every of My Subscribers is what I did not think would be expected from me. My design was Sir . . . to keep my Drawings intire that I may get them Graved. . . ."

Eventually, he did, the result being the book that made him an 18th-century celebrity. As for his 263 watercolors, from which the 52 in the current touring exhibition were chosen, they have indeed stayed "intire" as property of the British crown. Before the tour opens, I pay a visit to the Print Room of the Royal Library at Windsor Castle, where the watercolors have been housed since 1833. The library occupies several rooms in a warren of chambers deep within Windsor Castle, not far from the queen's living quarters. The decor here is high Victorian: nearly every surface except the floors is ornately carved. Lining the shelves are ancient tomes the size of tombstones, only thicker.

"These were the working drawings from which Catesby composed the plates, which he etched himself," says Henrietta McBurney, the Print Room's deputy curator and an organizer of the Catesby exhibition. Catesby had been born well-to-do, but his obsession with exploring the American wilderness for years on end had depleted his funds by the 1720s. Unable to hire out the engraving work, as was the custom for gentlemen authors, Catesby learned to do the copperplate etching himself. "He was a man of great spunk, wasn't he?" McBurney says. "He just sort of did it!" Catesby did get help to hand-color the etchings in the printed books, which he sold to subscribers in 20-plate installments—one guinea for an unpainted section, two for full color.

"There was a lot of excitement about the New World in

Scarlet Ibis

Catesby's day," McBurney says. "The people interested in his work didn't call themselves scientists. They were collectors, plantsmen, horticulturists, and they were interested not just in natural history but in ethnography, anthropology, the habits and artifacts of the Indians." They were intrigued by novelty—curious customs, exotic plants, strange animals—and Catesby delivered on all counts. He introduced his audience to flying squirrels, giant bullfrogs, dangerous panthers, and a shrub called the "toothache tree" whose leaves could be chewed as a palliative. Catesby was not always accurate, but he tried. In spirit and intention he was far more scientific than his predecessors. (A 1650 German ornithology had included engravings of a phoenix, a griffin and a harpy.) Contrary to settlers' lore, the snap of a coach-whip snake's tail couldn't "separate a Man in two Parts," Catesby reported, nor could snakeroot protect against rattlesnake bite: "Where a vein or Artery is pricked by the bite of a Rattle Snake no Antidote will avail anything, but Death certainly and Suddainly ensues, sometimes in 2 or 3 minutes, which I have more than once seen." That may have been a bit of an exaggeration. More questionable was this pithy comment on the now-extinct Carolina parakeet: "Their Guts is certain and speedy poison to Cats."

Catesby's portraits of the scarlet ibis and various woodpeckers were a surprise to many Europeans.

On purely esthetic grounds, in McBurney's view, Catesby was never an artist of the first order. His colleague Georg Dionysius Ehret, who etched two plates and contributed a dozen watercolors for *The Natural History*, was by far the better draftsman, with brush or graver. Still, says McBurney, "considering Catesby was never formally trained as an artist—or a naturalist—I think his achievement was fantastic."

Especially, she adds, given the circumstances in which he worked. Sliding a massive leather-bound volume containing watercolors of royal yachts out of the way, she opens a nearly two-foot-tall first edition of *The Natural History* and begins reading from the preface: "'I employ'd an Indian to carry my Box, in which besides Paper and Materials for Painting, I put dry'd Specimens of Plants, Seeds, etc. as I gather'd them. To the Hospitality and Assistance of these Friendly Indians, I am much indebted, for I not only subsisted on what they shot, but their First Care was to erect a Bark Hut, at the Approach of Rain to keep me and my Cargo from Wet.' It's quite fascinating, isn't it?"

The contrast between the miserable working conditions then and the rarefied atmosphere of Windsor Castle today is striking. Looking at Catesby's original watercolors, I ask conservator Michael Warnes if the small blotches on the drawing paper might be 275-year-old samples of Carolina mud. No, he says, that's old glue. The works are actually in superb condition: "The density and depth of the color are absolutely perfect. None of it's faded because the books have been closed all this time."

Though Catesby was a botanist at heart, birds predominate in his art. His colorful portraits of the wood duck, the scarlet ibis and various woodpeckers were, in their day, a surprise to the many Europeans who imagined the American wilderness as a gloomy and vaguely hostile place. McBurney points out one of her favorite Catesby birds, a luminous yellow goldfinch posed against an almost abstract grid of hundreds of tiny locust leaves. The foliage is as stylized as a subway map. Earlier, looking through *The Natural History* at Harvard's rare books library, I admired the etched version of this scene. Now, seeing the original watercolor, I'm struck by how bland and incomplete the print appears in comparison.

Catesby didn't choose his pairings casually—he sometimes dissected birds to study their stomach contents before choosing which berries or blossoms were suitable for a particular portrait. This practice marks him as innovative, according to Amy R. W. Meyers, curator of American art at the Huntington Library in California and co-organizer of the Catesby tour. "Mark Catesby helped advance what much later became the science of ecology—the interactions of living things in nature," she says. Before this, illustrations of plants were typically flat, idealized forms isolated on a white background, like generic diagrams in a tree-finder guide. As for illustrations of animals, if these included vegetation at all, it was strictly as window dressing. An exception was the Dutch painter and naturalist Maria Sibylla Merian, who a

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Flame Box Crab

He arrived at a meeting of the Royal Society carrying a poison ivy plant.

few decades earlier painted elaborate and highly polished compositions of butterflies and caterpillars with the plants on which they fed.

Catesby's juxtapositions, however, went deeper—sometimes literally. He entwined a snake and a potato vine after learning that farmers in Virginia unearthed the snakes when harvesting this crop. He posed bobolinks with a gracefully arching stalk of rice after deducing that the birds were migrating from Cuba to the Carolinas to follow the ripening rice fields. (Settlers had thought the birds were disappearing each year to hibernate, possibly in mud at the bottom of ponds.) Expediency was probably a factor in Catesby's doubling up of species: without dual portraits, his book would have required twice as many plates. And some of his combinations—in particular, a ferocious viper being regarded by a sleepy-looking bull—seem utterly whimsical. "I think he was probably doodling," says Meyers.

Artistic flourishes aside, Catesby's intense study of nature had a highly practical side. "He was part of a network of people who believed that getting plants from the New World to grow in English soil was more important than filling cabinets with dried specimens," Meyers says. She cites Catesby's declaration that in a single lifetime "a small spot of land in America has furnished England with a greater variety of tree than has been procured from all the other parts of the world for more than a thousand years past." Catesby himself could take much of the credit for this botanical diaspora. Either through seedlings or the printed page, he introduced England to some species of dogwoods, laurels, acacias, lady's slippers, lilies and catalpas, among many others. On publication, Catesby's book was an immediate sensation. Its purchasers included not just English naturalists but the queen of Sweden, the Russian ambassador, the Princess of Wales, and assorted dukes, lords and earls. Hans Sloane, characteristically, snapped up five copies. Pirated editions appeared in French, German, Dutch and Latin. Acclaimed for this "curious and magnificent work," Catesby was elected a fellow of the Royal Society in 1733.

For all his achievements, Catesby's time in the limelight was brief. He seldom left England after 1726, nor did he publish anything to rival *The Natural History*. To make ends meet, he worked as a horticulturist at a succession of London nurseries and peddled his book on the side. Late in life, Catesby—ever the curious naturalist—arrived at a meeting of the Royal Society carrying a poison ivy plant he'd succeeded in growing from stock sent to him from Virginia. At age 65, and by now living in a shabby quarter of London, he was married for the first time. He died two years later in 1749. He left his widow and two young children little more than his watercolors, his copperplates and a few unsold books.

Catesby's slide into near oblivion since then has many reasons. The names that Catesby bestowed on many of the unfamiliar plants and animals he illustrated became obsolete with the adoption of Linnaeus' more scientific two-word classification scheme soon after Catesby's death. Colonial hostility, then independence, dampened the exchange of plants and information between England and the New World that Catesby had worked so hard to encourage. And, of course, there was Audubon. Though he, like Linnaeus, relied on Catesby, his paintings for *Birds of America*, published between 1827 and 1838, clearly surpass Catesby's creatures as full-bodied works of art. Audubon created his dramatic and sometimes rather bloody tableaux by painting dead animals, which he posed using armatures and hidden wires. Catesby, too, killed many of his models before painting them, but where possible he worked from life. Ironically, his preference for drawing unfamiliar animals as he glimpsed them in the wild often resulted in images that look artificial compared with those of Audubon.

Finally, during his own lifetime Catesby's reputation faced an obstacle over which he had no control. Nearly 80 years before his birth, the Catesby name was sullied by a distant relation. A Robert Catesby had masterminded the Gunpowder Plot in 1605, which targeted the Houses of Parliament for destruction. Unfortunately, crime does pay, historically speaking. The *Encyclopaedia Britannica* has long listed Robert while omitting Mark. Perhaps an editor of the forthcoming revision will take in the current exhibition of Mark Catesby's charming watercolors and redress this wrong.

Two lilies by Catesby (opposite) include the red lily, later named Catesby's lily—its bulb is at lower left—and the turk's cap. The crab above is found in the Bahamas.

Doug Stewart, a regular contributor to SMITHSONIAN, *also writes frequently about modern-day animals for* National Wildlife.

S M I T H S O N I A N

The Man Who Believed in Fairies

FOR SIR ARTHUR CONAN DOYLE, CREATOR OF SHERLOCK HOLMES, THE PROOF WAS IN THE PICTURES ◆ **BY TOM HUNTINGTON**

"THIS AGENCY STANDS FLAT-footed upon the ground, and there it must remain. The world is big enough for us. No ghosts need apply." So said Sherlock Holmes in "The Adventure of the Sussex Vampire," and I have to wonder what the great sleuth's creator, Sir Arthur Conan Doyle, thought as he wrote that. Did he smile? Did he shake his head in resignation? Certainly those words resonated, because when the story was published in 1924, Doyle was the world's foremost believer in ghosts.

For 14 years, from the time he converted in 1916 until he died in 1930, the famous author was a tireless missionary for Spiritualism, the belief that human personality survives death and that the living can communicate with the dead. To support the cause, he traveled around the world on lecture tours, wrote books, spent thousands of pounds of his own money and even opened a psychic bookshop in London. His reputation suffered, especially after he began championing the existence of fairies, an incident somewhat fancifully retold in the film *Fairytale—A True Story*, starring Peter O'Toole as Doyle, which is scheduled to be released by Paramount Pictures next month. How could the man who created the super-rational Sherlock Holmes believe in voices from the dead, fairies, ectoplasmic apparitions and such? "Readers appreciated and loved Arthur Conan Doyle," wrote his first biographer. "They deprecated the fact that he ever espoused the cause of Spiritualism. The writings of the last twelve years of his life they would willingly ignore."

Modern Spiritualism was born in 1848 in Hydesville, a small town near Rochester, New York, after a house rented by a family named Fox supposedly was plagued by mysterious rapping sounds. One day, Kate

Opposite: Elsie Wright gazes at a flower-proffering sprite in a photograph Doyle said proved the existence of fairies. Elsie did not confess the hoax until 1983, and Doyle died a believer.

Doyle's defense of the Cottingley fairy photographs and the little girls who took them is the subject of a new film, *Fairytale—A True Story*, starring Peter O'Toole as Doyle.

Fox, 11, asked the invisible rapper to repeat what she did as she snapped her fingers—and the snaps were echoed with raps. Using a code and the alphabet, the Foxes determined that the rapper was the spirit of a murdered peddler who had been buried in the basement. Subsequent digging found what may have been traces of human hair and bones. The house's previous tenant, fingered as the murderer by the raps, denied the accusations.

For believers in Spiritualism, the "Rochester Rappings" proved the existence of an intelligence beyond the vale. Kate and her sisters became internationally known mediums, but in 1888 sister Margaret, by then, like Kate, a rather pathetic alcoholic, confessed that they made the celebrated rappings by cracking their big toes. (She later recanted the confession.)

The Fox sisters spurred a huge interest in things psychic. After becoming popular in the United States in the 1850s, Spiritualism crossed the Atlantic. Séances and table turning became all the rage. Spiritualistic circles sprang up, often centered around a charismatic medium. Scottish medium Daniel Dunglas Home—"the most remarkable individual of whom we have any record since the age of the Apostles," according to Doyle—could reportedly float up to the ceiling in broad daylight. At séances, usually conducted in darkened rooms, "ectoplasm" flowed from the body of a medium, sometimes forming limbs or faces.

Spiritualism's best-known advocate was born on May 22, 1859, in Edinburgh, Scotland, where he was raised on the edge of poverty. His father, Charles Doyle, a sometime illustrator, was an alcoholic who had to be institutionalized. His mother, Mary, the guiding figure in his life, gave her son an appreciation for the chivalric ideals of the past. From a Catholic family, Doyle was sent to Jesuit schools—where he lost his faith. "I remember that when, as a grown lad, I heard Father Murphy, a great fierce Irish priest, declare that there was sure damnation for everyone outside the Church, I looked upon him with horror, and to that moment I trace the first rift which has grown into such a chasm between me and those who were my guides."

His interest in occult matters dated to the late 1880s, when he was a young doctor in the Portsmouth suburb of Southsea. Finding the medical profession less than rewarding, Doyle tried supplementing his income by writing. One of the books he wrote in Southsea was titled *A Study in Scarlet* and featured a detective named Sherlock Holmes. He also joined the Portsmouth Literary and Scientific Society and conducted experiments in telepathy with a fellow member. "I showed beyond any doubt whatever that I could convey my thoughts without words," he later explained. In 1887, the young doctor wrote to the Spiritualist publication *Light*, saying a séance he attended "showed me at last that it was absolutely certain that intelligence could exist apart from the body." He

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Doyle and his second wife, Jean, herself a medium, toured America to promote Spiritualism, with decidedly mixed results.

later claimed that it took decades of study before he embraced Spiritualism, but his letter to *Light* indicates that he was predisposed to believe.

By 1916, Sir Arthur Conan Doyle—he added the "Sir" when he was knighted in 1902—was loved and respected around the world. Sherlock Holmes was just one of many characters to spring from Doyle's imagination. Besides novels and short stories, he also wrote poems, plays, innumerable letters to the press on the issues of the day and a six-volume history of World War I. During the Boer War, he served in an army hospital, and he earned his knighthood after writing a defense of the British conduct in that conflict. He was a great sportsman who loved boxing, golf, billiards, bicycling and cricket, and he is credited with helping to introduce skiing into Switzerland. Like a British Teddy Roosevelt, he impressed people with his boyish enthusiasm. "I had come to think of Doyle as a great rollicking, good-natured, adventurous man who had never forsaken his boyhood, or rather had brought the spirit of youth into his maturity," wrote George H. Doran, his American publisher. He was, in short, the very antithesis of a man who would try to talk with the dead. Then he converted to Spiritualism.

There was apparently no great epiphany—no Saul-on-the-road-to-Damascus experience. Doyle had weighed the evidence for years. He had been impressed by the accounts of scientific men who believed. Sir William Crookes, who discovered thallium, had worked with D. D. Home and a medium named Florence Cook and pronounced them genuine. Physicist Sir Oliver Lodge had written a book, titled *Raymond*, about his communications with his dead son. If these men of science believed, Doyle reasoned, who was he to argue?

Strangely enough, his own personal experiences before his conversion were never very spectacular, nothing like the stories he had read about Home floating to the ceiling or Florence Cook materializing a woman who called herself "Katie King" and claimed to be the daughter of the long-dead buccaneer Henry Morgan. Doyle received messages spelled out at séances through "table tipping," like one from a spirit who told him, among other things, "that Mars was inhabited by a race more advanced than us, and that the canals were artificial." When a young woman living with the Doyles, Lily Lodes-Symonds, developed the power of "automatic writing," in effect taking dictation from the dead, Doyle found her messages generally convincing. "Altogether, no one could doubt the reality of her inspiration, though the lapses were notable," he wrote. "It was like getting a good message through a very imperfect telephone."

There's also little doubt that the great slaughter of World War I increased Doyle's susceptibility. The war's agony, he wrote, made him realize that Spiritualism was "really something tremendous, a breaking down of the walls between two worlds, a direct undeniable message from beyond, a call of hope and of guidance to the human race at the time of its deepest affliction." Some thought the World War I-related deaths of his son Kingsley and his brother, Innes, sent Doyle into the arms of Spiritualism, but both men died after his conversion.

For Doyle, Spiritualism's great appeal was its offer of a religion that could be tested by scientific means. He wanted to have his faith—but prove it, too. "I must have definite demonstration," he wrote, "for if it were to be a matter of faith then I might as well go back to the faith of my fathers." Spiritualism also filled the void left by his rejection of Catholicism. In an early autobiographical novel, *The Stark Munro Letters*, the protagonist turns away from Wesleyanism and says, "When first I came out of the faith in which I had been reared, I certainly did feel for a time as if my life-belt had burst." In Spiritualism, Doyle found the "life-belt" he needed.

Once converted, he set out to convert others. He traveled all through

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In Spiritualism's heyday, thousands flocked to séances to hear mediums in trance speak with spirit voices (above) or exude "ectoplasm" (opposite).

Britain, generating great publicity for the movement. The combination of his crusading and the public's profound grief over the war led to a doubling of societies associated with Britain's Spiritualists' National Union between 1914 and 1919. After the war, he made trips to Australia, the United States, Canada and South Africa, speaking to thousands. "He was probably the greatest propagandist the Spiritualist movement ever had and a truly charismatic figure," wrote Geoffrey K. Nelson in *Spiritualism and Society*.

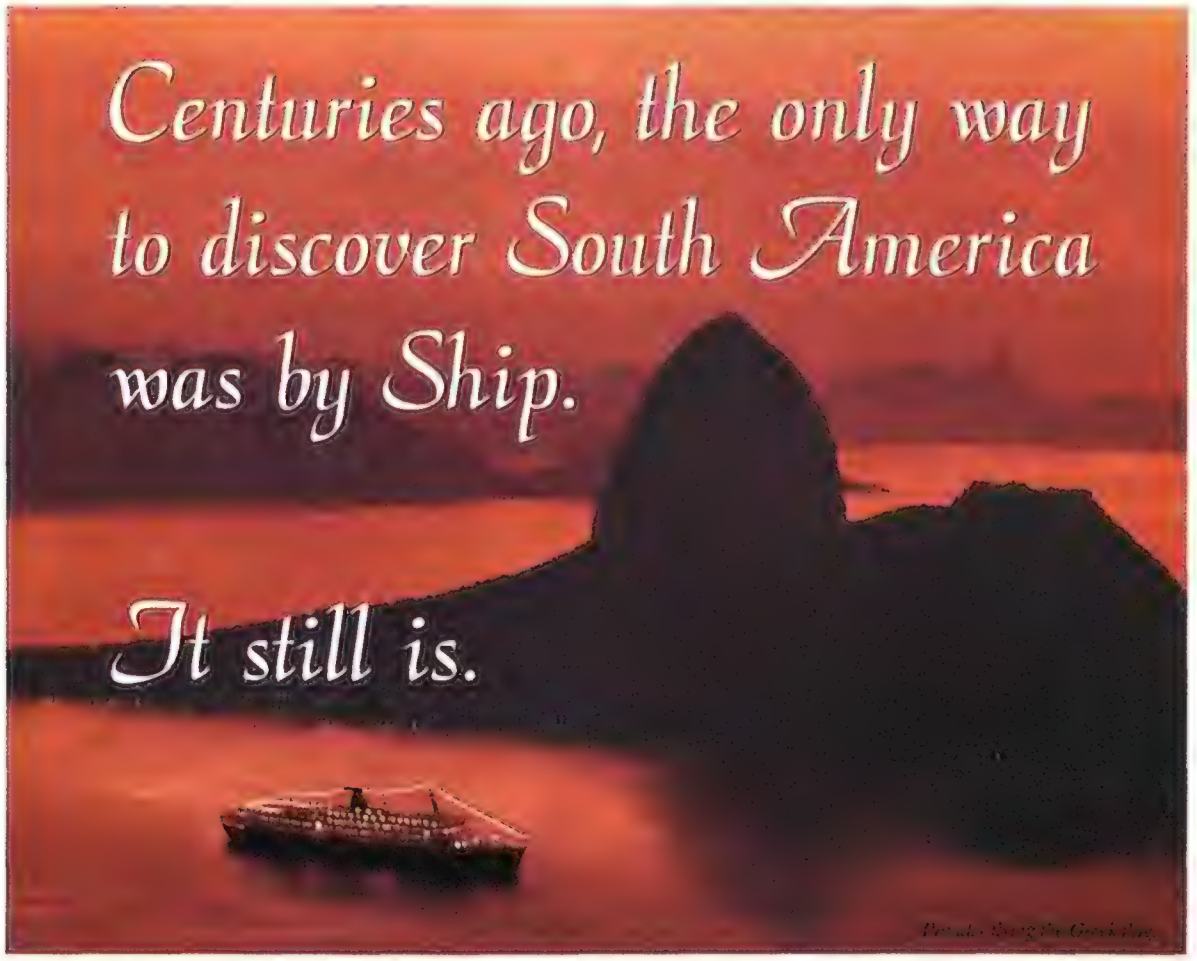
The message Doyle delivered at his lectures was the promise of life after death that was much like life before death—only better. Death freed the "etheric body," which looked like the living one, minus all imperfections. The dead continued to pursue their interests or hobbies. Mismatched couples would not meet in the afterlife; marriages after death were reserved for ideal mates, though there was no sex. There were, however, pets, alcohol, tobacco and books. Children continued to grow to adulthood in the afterlife. The dead also wore robes—"modesty does not cease with this life." As souls developed spiritually, they could move on to higher planes.

An early biographer detected a glaring contradiction. Doyle went out of his way to criticize "materialists" who he believed were too attached to the solid pleasures of the flesh. In his own view of the afterlife, however, "Conan Doyle, the recognizable and conscious entity of this material world, went on for ever after death, presumably enjoying all the things that had made life so delightful. . . ." Perhaps the contradiction isn't so surprising in one who insisted that his faith be proven.

Doyle's friendships were strained by his unyielding belief. "He carried it to extreme lengths," an acquaintance observed, "showing impatience with anyone who expressed the slightest doubt."

One friendship that ended badly was with the famed magician and escape artist Harry Houdini, with whom Doyle began corresponding in 1920. "Some of our people think that you have yourself some psychic power," Doyle wrote in a postscript to a letter that year, "but I feel it is art and practise." That feeling would change.

Houdini approached the subject of Spiritualism with great skepticism. He knew about fake mediums, having been one for a brief time early in his career. But Doyle kept trying to bring Houdini around. "I have had very conclusive evidence since my two books were written—six times I have spoken face to face with my son, twice with my brother, once with my nephew—all beyond doubt in their own voices and on private matters. . . . I know it is true, but we can't communicate that certainty to others. It will come—or not, according to how far we work for it," he wrote to his friend.



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Things began to unravel after a séance in Atlantic City. Acting as medium was Doyle's wife Jean, whom he had married after his first wife died of tuberculosis. Lady Doyle had become a convert to Spiritualism, and she showed a talent for automatic writing.

"Presently, Lady Doyle was 'seized by a Spirit,'" recalled Houdini of the séance. "Her hands shook and beat the table, her voice trembled and she called to the Spirits to give her a message. Sir Arthur tried to quiet her, asked her to restrain herself, but her hand thumped on the table, her whole body shook and at last, making a cross at the head of the page, started writing." When she finished she had given Houdini 15 pages of messages purportedly from his late mother.

The founders of modern Spiritualism, the Fox sisters made "raps" with their toes.

This was no small matter to Houdini. "If there ever was a son who idolized and worshipped his Mother . . . that son was myself," he wrote. Yet he was not convinced. His mother was Jewish—why the cross? She never learned to speak or write English—why was the message in that language?

Doyle found Houdini's objections without foundation. His wife always marked her pages with a cross to ward off evil, he said. Furthermore, "when a medium is not in trance, but writing by inspiration, it is the flood of thought and of emotion which strikes her, and has to be translated by her in her own vocabulary as best she can." When Houdini told the New York *Sun* that he had never seen anything to convince him of life after death, Doyle responded. "I felt rather sore about it," he said. "I know by many examples the purity of my wife's mediumship, and I saw what you got and what the effect was upon you at the time." The gulf between the two men grew. After an exchange of increasingly tart letters, they stopped corresponding, and Houdini died two years later.

Yet Doyle remained fascinated by the magician. In the years since stating that Houdini's effects were done by "art and practise," he began to suspect there was something more at work. In a letter to Houdini's biographer, he said, "I have no more doubt that he used psychic powers than I have that I am dictating this letter."

Perhaps the greatest blow to Doyle's reputation was his championing of the Cottingley fairy photographs. In 1917, two cousins, Frances Griffiths, 10, and Elsie Wright, 16, from the Yorkshire village of Cottingley, took pictures of themselves cavorting with fairies and goblins. Doyle saw the pictures several years later and wrote to Houdini that he had "two photos, one of a goblin, the other of four fairies in a Yorkshire wood. A fake! you will say. No, sir, I think not. However, all inquiry will be made. . . . The fairies are about eight inches high. In one there is a single goblin dancing. In the other four beautiful, luminous creatures. Yes, it is a revelation."

In 1920, Doyle published the results of his inquiries in the *Strand* magazine and then expanded the account in a book titled *The Coming of the Fairies*. He was quick to distance the fairy issue from that of life after death—"I would add that this whole subject of the objective existence of a subhuman form of life has nothing to do with the larger and far more vital question of

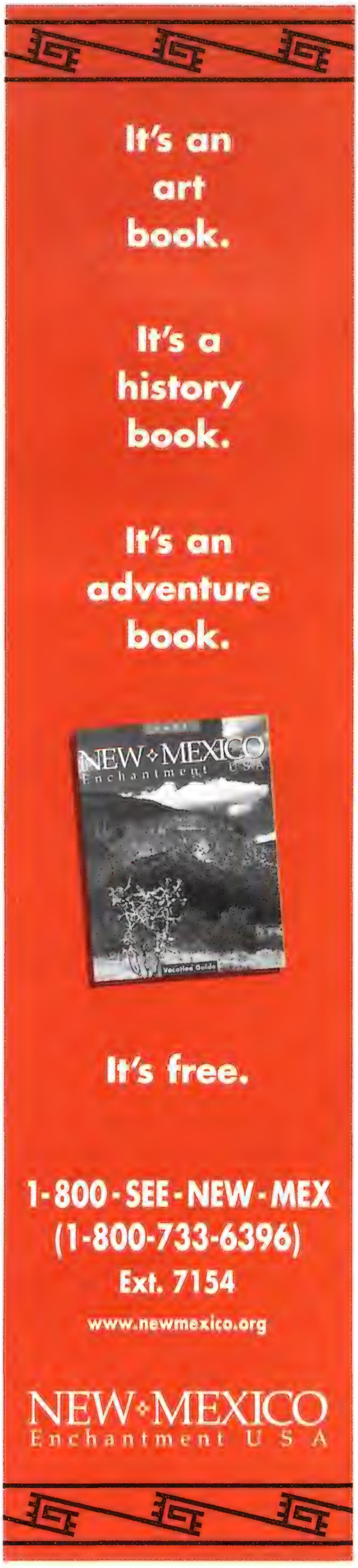
Harry Houdini, whose longtime friendship with Doyle foundered over the truth of Spiritualism, testified before Congress in 1926 on the dangers of phony mediums.

spiritualism," he wrote. That said, he was off and running. "I will now make a few comments upon the two pictures, which I have studied long and earnestly with a high-power lens.

"One fact of interest is this presence of a double pipe—the very sort which the ancients associated with fauns and naiads—in each picture. But if pipes, why not everything else? Does it not suggest a complete range of utensils and instruments for their own life? Their clothing is substantial enough. . . . And what joy is in the complete abandon of their little graceful figures as they let themselves go in the dance! They may have their shadows and trials [but] there is a great gladness manifest in this demonstration of their life."

Few took the fairies seriously. When Doyle showed the photographs to Sir Oliver Lodge, whose psychic studies he had found so influential, the physicist suggested that perhaps pictures of dancers had been "superimposed upon a rural British landscape." In his book, Doyle also quoted "Major Hall-Edwards, the famous authority upon radium," who said, "[As] a medical man, I believe that the inculcation of such absurd ideas into the minds of children will result in later life in manifestations of nervous disorder. . . ." The girls themselves did not confess until 1983, when Frances, then 76, and Elsie, 82, finally came clean. The wee folk were actually cutouts on stiff paper, propped up with hatpins.

Eventually Doyle's obsession crept into his fiction. The occult had been featured in many of his stories, but Spiritualism was handled differently. In *The Land of Mist*, he had Professor Challenger, the star of his book *The Lost World* and second only to Holmes in popularity, convert. "I was justified in my scientific scepticism, but you have to-day offered me some incontrovertible evidence," the professor finally admitted—words Doyle no doubt longed to hear spoken by skeptics all over the world. (Doyle liked the character of Challenger as much as he grew to dislike Holmes. Perhaps that's why



Frances Griffiths appears bemused in one of the first Cottingley photographs, taken in 1917 by her cousin Elsie. The frolicking fairies were cutouts, propped up with hatpins.

the detective never converted—to Doyle he must have represented all the scoffers who refused to accept the "incontrovertible evidence" he offered.)

The public's faith in Doyle, however, was wearing thin. "He's Beginning to Strain Our Patience," was the headline of a *New York Times* editorial written during the author's 1923 lecture tour. "Again Sir Arthur Conan Doyle is placing on many of this country's inhabitants the embarrassing task of trying to strike a balance between their long-established liking for him and their equally well-settled dislike for what he is doing." During the same lecture tour, John F. Hylan, the mayor of New York City, was moved to attack Doyle's beliefs. "If he really believes all he says he does, I'm just sorry for him," said the mayor.

Eventually Doyle decided to devote most of his energy to Spiritualism (although he occasionally delivered a Sherlock Holmes story—after all, they paid the bills for his important work). "He could not be persuaded to write on any theme apart from the psychic," recalled George H. Doran. "His enthusiasms carried him into speculative ventures such as photography of fairies; he invited the pity and the scorn of the disbeliever; he brought upon himself the criticism of his associates and followers, and not all the ardour and force of his philippics quite restored him to the invincibility of his earlier authority and leadership."

It's easy to sense that Doyle relished the chance to fight the good fight, come what may. After all, this was the man who would have the words "Steel True, Blade Straight" carved on his tombstone. Wrote his son Adrian, "Just as his forbears had sacrificed their all for the Catholic faith, so did Conan Doyle follow devotedly in their footsteps in regard to Spiritualism."

Was Doyle gullible? To his credit, in light of the times some of the phenomena he investigated defied easy explanation. On the other hand, he was so eager to believe that he would even defend mediums who had been caught cheating. "We must not argue that because a man once forges, therefore he has never signed an honest cheque in his life," he said.

For Doyle, a man of great honesty and integrity, the existence of the spirit world was more likely than the idea that people of good reputation would go to such great lengths to lie and cheat—especially when those involved were children. "Sir Arthur was bighearted, zealous, sincere, and 'an earnest godly man,'" wrote psychic researcher Walter Franklin Prince, "but these qualities, admirable as they are, do not define an astute psychic researcher." According to Houdini, Doyle was "good-natured, very bright, but a monomaniac on the subject of spiritualism. Being uninitiated in the world of mystery, never having been taught the artifices of conjuring, it was the simplest thing in the world for anyone to . . . hoodwink him."

Faith can be a powerful force. It was faith, after all, that drove the members of the Heaven's Gate cult this year to eagerly embrace suicide, for reasons that seemed absurd to outsiders. Once he converted to the Spiritualist faith, Doyle never wavered. No doubt he breathed his last with confidence that he would be moving on to a better place, if not a terribly dissimilar one. In a letter written shortly before his death he said, "I write this in bed, as I have broken down badly, and have developed Angina Pectoris. So there is just a chance that I may talk it all over with Houdini himself before very long. I view the prospect with perfect equanimity. That is one thing that psychic knowledge does. It removes all fear of the future. . . ." He died on July 7, 1930.

More than two decades before his conversion, Doyle wrote a Sherlock Holmes tale titled "The Adventure of the Cardboard Box." At the end, Sherlock Holmes says something that surely echoed his creator's feelings. "What is the meaning of it, Watson?" the detective asks. "What object is served by this circle of misery and violence and fear? It must tend to some end, or else our universe is ruled by chance, which is unthinkable. But what end? There is the great standing perennial problem to which human reason is as far from an answer as ever." It was a problem Sherlock Holmes never attempted to solve. His creator, at least, made the effort. ♜

Tom Huntington is the editor of Historic Traveler *magazine. He profiled Fenway Park in the October 1994* SMITHSONIAN.

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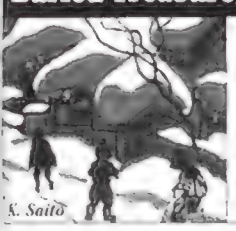

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The Price of a Dream: The Story of the Grameen Bank and the Idea That Is Helping the Poor to Change Their Lives

By David Bornstein
Simon & Schuster, $25

Bangladesh is a country that generally intrudes on the Western imagination only when disaster strikes. The floods that ravage the densely populated nation usually catch our attention only when the death toll passes 200,000, as in the 1970 cyclone, which led to George Harrison's Concert for Bangladesh. The more common tragedy, the daily struggle for food and shelter by the country's poorest people, goes largely unnoticed. It is all the more remarkable that *The Price of a Dream*, by David Bornstein, presents an upbeat history of a homegrown model that actually seems to work, and does it through fully realized portraits of the people whose lives are touched by it.

From a modest beginning in 1977, the Grameen Bank has become a model for development projects throughout the world. Its guiding principle is stunningly simple: it provides microloans—in Bangladesh, often as small as $60 over a year—for small-business enterprises such as peddling or home-based bamboo weaving. Sometimes the loan can cover the purchase of a much-needed dairy cow. These small loans can have huge consequences for the borrowers, making the difference between barely scrounging a meal once a day and eating three times a day.

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The bank is the brainchild of Muhammad Yunus, a Bangladeshi economist who received his Ph.D. from Vanderbilt University in Nashville. When he returned to Bangladesh after it became independent of Pakistan in 1971, he was frustrated to find that large-scale international development projects had little impact on the lives of impoverished villagers, who form the majority of the country's population. As early as 1976, Yunus presented a paper titled "Institutional Framework for a Self-Reliant Bangladesh," in which he argued forcefully that locally based institutions would make better use of Bangladesh's resources.

Over the years, he has come to believe that the widespread availability of credit on reasonable terms is the key to solving the problems of rural underdevelopment. In its absence, villagers are forced to rely on usurious moneylenders to tide them through periods of low earnings or to make the investments that will allow them to improve their means of livelihood. As a result, villagers can end up in what Yunus calls "a form of bonded labor." So crucial is the need for credit that Yunus has often expressed the hope that the United Nations would amend its Universal Declaration of Human Rights to include "credit for self-employment."

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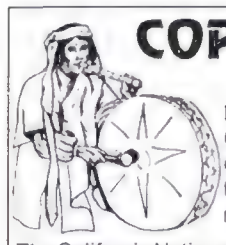

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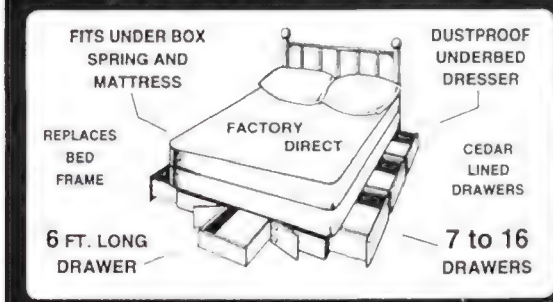

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rowers group. Groups share responsibility for loan repayments—and defaults—so they are very careful in choosing new members. Since most villagers have none of the data that bankers traditionally use to decide if a prospective borrower is creditworthy, who is in a better position to judge than the villagers themselves? As Bornstein writes, neighbors would detect the early warning signs of repayment problems, because "villages afford little privacy. In rural Bangladesh, villagers can smell what their neighbors are cooking for dinner."

Muhammad Yunus remains the moving spirit behind Grameen, though he has tried to institutionalize the bank's practices so that it can carry on when he no longer leads it. Bornstein conveys Yunus' charisma without indulging in hagiography, and acknowledges that "although I felt pulled in [by Yunus' personality] I was conscious of being somehow pushed away."

One of the most interesting aspects of Yunus' work has been his impact on the role of women in this largely Islamic country. Early on, Yunus recognized that women's unpaid labor was an economic resource that could benefit the entire country. Currently, 94 percent of the bank's borrowers are women.

What makes the book such compelling reading are the portraits of the bank's clients and staff members. The author accompanies bank employees as they tramp through the countryside to collect loans and meet with borrowers groups, and effectively conveys a picture of the daily work of the bank. His observations of the villagers are moving without ever being sentimental. In the process of telling their stories, he has not only provided the history of a groundbreaking institution, he has illuminated the lives of people that few of his readers are likely to meet for themselves. We are the richer for having made the journey with him.

Reviewer Bruce Shenitz is a freelance writer who is based in New York City.

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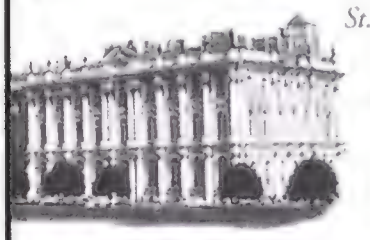

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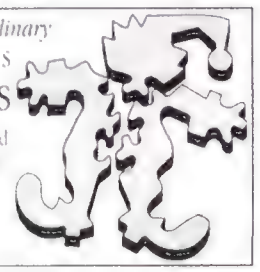

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North Country, A Personal Journey

By Howard Frank Mosher

Houghton Mifflin, $23

"Anyone who wants to take a trip as badly as you do will find a way to take it," a Gypsy fortune-teller in New York City told Howard Frank Mosher.

Sure enough. That year, 1993, Mosher turned 50. He decided to "celebrate" with a "midlife adventure"; he would drive alone from Maine to Washington State, the radio wailing country music, his fly rod in the trunk, and explore the northern borderlands.

Mosher, a novelist, lives along the border himself, in Vermont's remote Northeast Kingdom, where roads are mostly empty except for logging trucks and beat-up tractors, and signs warn of moose. A local opera house has its stage in Quebec, its seats in Vermont. So Mosher knew the borderlands. But he wanted to see more, to set out for the wilder places.

Just before he left, *Harper's* rejected his latest story. Too old-fashioned, said the note, "with its traditional beginning, middle, and end." That required exorcism. Mosher reflected, "as I nailed the note to the side of my own weathered and disused barn at home and blasted the living hell out of it with my shotgun, what a sorry end this pellet-riddled scrap of paper was for a tree that may once have shaded a trout brook or a deer run."

He begins at Lubec, Maine, a town expiring with its sardine industry. As one old-timer says, "Who wants to open a can of oily old sardines when they can get a Big Mac anytime they wants?" It would become a theme of *North Country*, Mosher's book about his trip: "All my life I've been haunted by disappearances," he writes. He finds old border industries gone—as is the case in North Dakota's gouged-out land, where coal used to be—and no farms. But the old culture lingers, ignoring the boundary. As a Maine

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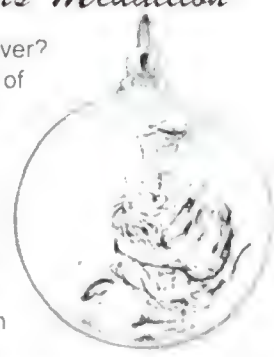

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man tells him, "I don't see any border, do you? Just a beautiful country with a river running through it."

Most of the borderlands are so empty that Mosher finds his radio is producing little more than static. But he meets many fishermen, his coreligionists, from a 90-year-old Thoreau-quoting Maine guide to a drying-out alcoholic newspaperman bleakly fishing Washington's dam-tamed Columbia River, who looks as though everything his blue eyes alight on offends him. "Naturally," writes Mosher, "I liked him immediately."

IN SEARCH OF SEMI-LOST REALMS

MOSHER ALSO FINDS I'LL-DO-IT-MYSELF-ism, like the Quebec bush pilot, massive as a Mack truck, who knows how to get his floatplane up from ponds "too small to take off from": hitch the plane to a shoreline spruce with a stout rope, "rev up the engine until the hawser hums with the tension, then pull the slipknot and use the plane's lurching leap forward as momentum to take off." Mosher discovers semi-lost realms, like Maine's border-straddling Madawaska Republic, settled by French-Canadians hounded from their Acadian homeland by the British, and a Minnesota town called "Food Gas Grocs Beer" because nothing remains but a store with that sign.

Mosher's book is a webwork of borderlands vignettes. There is the politically conservative Duluth businessman who nevertheless sports a Sierra Club bumper sticker because of a waterfall where he has long camped. "If the preservationists can save that waterfall for another forty years, God bless them," he says. In Pembina, North Dakota, Mosher makes the acquaintance of a winning stock car racer, an 18-year-old girl who has christened her wheels "The Brat Is Back."

Borderlanders regard government dubiously, Mosher finds. He gets rebellious himself, after a turn down an attractive lane in North Dakota leads

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him to an unmarked ICBM silo, where an Air Force sergeant hassles him. In Idaho, Mosher finds that the antigovernmental streak has attracted extremists. One man, shirtless, arms tattooed with swastikas, a pistol in a shoulder holster, announces that he is there to get away from things. Mosher asks him what. "Nonbelievers," the man says. "Schools. Government. Taxes. Electricity. The devil. . . . Writers like you." The next day, fishing in Idaho's border mountains, Mosher comes across a menacing bowman in camouflage and circles through the woods to escape the mysterious hunter.

But many of his encounters are poignant. Signs plead, "Our Town Needs A Doctor." He meets two rugged smokejumpers who feel unwelcome in their Washington borderlands hometowns because they are a homosexual couple. There is the cowboy pining for the city woman who jilted him and the retired Blackfoot sheriff who spent much of his career helping wayward kids find themselves.

Mosher's trip ends at Blaine, Washington, where he meets two crabbers, a man and his teenage son. Nineteen years ago, the man flew in from Fiji, a penniless immigrant. "Now I have a wonderful wife, four great kids, a house," he says. "And next month I'm buying a salmon trawler."

What Mosher discovers on his trip is his own borderlands life—"walking the mountain each day of the year, visiting with friends, fishing for brook trout, watching a pickup baseball game on the village green, sitting quietly in the evening with the person I've loved for thirty years and more, reading a good old or new book, writing a new story. . . ."

And so Howard Frank Mosher drove home. And wrote a book.

Richard Wolkomir, a frequent contributor to SMITHSONIAN *whose recent articles include a history of flags and a look at the science of soil, writes from his own north-country household in Vermont.*

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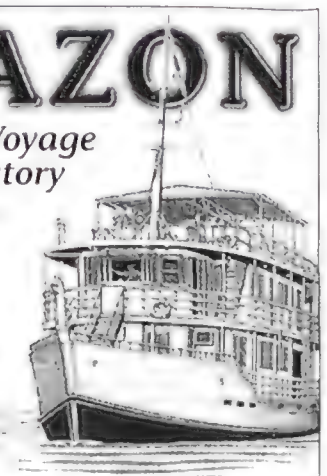

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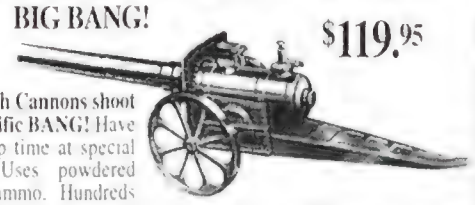

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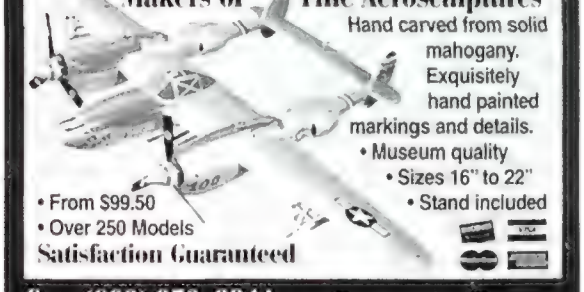

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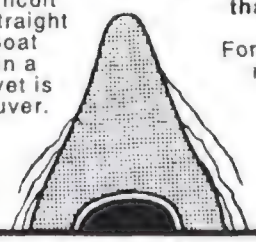

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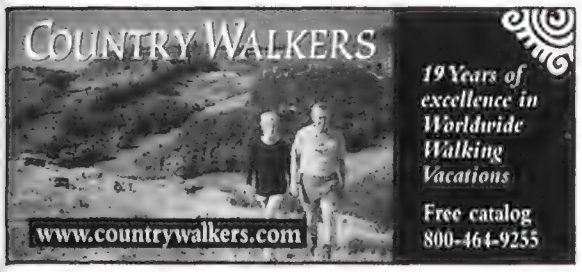

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Célestine: Voices from a French Village

By Gillian Tindall

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The letters seemed innocent enough: seven slips of paper tucked into a cardboard case in an abandoned farmhouse. Others who had come to collect items left to them by the late owner of the house in the tiny French village of Chassignolles had overlooked the box. Historian and author Gillian Tindall, who had come for a footstool promised her, was more curious. ". . . I creaked open the shutter over the stone sink in the smaller room," she writes, "dusted the long-dried surface with my handkerchief and carefully spread the letters out."

The letters, she discovered, were written in the early 1860s to Célestine Chaumette, daughter of the local innkeeper and grandmother of the most recent owner of the now-deserted farmhouse. All but two were proposals of marriage. Staring at the "soft wads of paper delicate as old skin," the author made a decision about Célestine, her suitors and the people they had known: "I would bring them to life again."

To accomplish her mission, which she does admirably, Tindall spent years poring over minutes of the municipal council dating back to the early 19th century. She studied ancient archives, census records, old newspapers. With gentle tenacity, she pried loose memories of long-gone ancestors from elderly villagers.

The coaxing was not always easy. "Even folk memory, so durable, eventually blurs and fades, conflates two people into one, telescopes generations and at last extinguishes," she writes. "The most colourful, long-mythologized figures pass in the end into the great, quiet dark, becoming as if they had never been born. . . ."

Though willing to be helpful, the locals were sometimes confused by this

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étranger from England who had bought a house in their village and was so fascinated with a past which they saw little point in examining. In response to a question about an ancestor, one farmer "remarked gently that it was a good long time ago, wasn't it, and that in those days people were different. Weren't they?"

Because of Tindall's determination to discover "every single person they [Célestine and her suitors] knew and most of those they were ever going to know," there are moments when reading the book is like wading through the begats in Genesis. To add to the confusion, the citizens of Chassignolles had the unsettling habit of changing their first names or varying the spelling from generation to generation. There are Silvain-Germains and Silvain-Bazilles and Apères who sometimes appear as Apaires.

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THOUGH IT IS NOT ALWAYS EASY TO keep the characters straight, in the end it doesn't matter, for it is the re-creation of a forgotten time that is the essence of the book—the awareness of change and the certainty of continuity. "It has been the unbroken threads between the Chassignolles of the past and that of the present that have drawn me into the web of its history in the first place," writes Tindall, "and it is on these threads that the story is strung."

Tindall's history is most alive when the present-day citizens of the village recount their memories of days long gone. Célestine's mother, the author learns from one Mademoiselle Pagnard, died of breast cancer, which she treated—apparently unsuccessfully—in the accepted manner of the time: the application of raw steak to the affected area to draw out the cancer. "I don't know . . . how long the meat was supposed to stay there," the old woman muses. "Perhaps it had to be renewed regularly? Expensive, if so."

On another occasion, when Mademoiselle Pagnard reminisces about her

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great-grandmother's cooking, Tindall writes, "And I too tasted in my imagination the creamy potato-cakes of a woman born around the time of the Battle of Waterloo."

Tindall's quiet humor enriches her text throughout. Noting the people's deeply held conviction that after death they surely would be reunited, she writes, "No wonder the Catholic Church in France at this period rather discouraged second marriages: the practical problems posed in Eternity by such temporal readjustments would hardly have been manageable."

And when she reads a 19th-century mayoral pronouncement that the church was "in a state of dilapidation . . . which might not only have an evil influence on the religious sentiments of the population but also endanger their security," Tindall writes, "In brief, the old, squat belfry looked as if it was going to fall down."

The author's lyric style brings past and present alive and unites them as one. Writing of a rural winter wedding: "I see it as one of those very cold, absolutely still days in central France when hoar-frost outlines every leaf, stem, twig and spider's web beneath a grey sky from which the sun does not emerge all day to break the spell on this petrified landscape."

Once, spotting Tindall looking through old minute books in the town hall, one of the villagers commented, "You've taken over one of our houses. Are you taking over our past too?" Tindall protested. "But you didn't want it! You could have done this research. But you haven't." The man relented. "Maybe we need you," he conceded. "Maybe you are giving our past back to us." And indeed she has—not just to the people of Chassignolles but to all who read her book.

Freelancer Emily d'Aulaire writes reviews from Connecticut. She and her husband, Per Ola, travel the world on assignment. They reported recently for SMITHSONIAN *on pastry chef Jacques Torres.*

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THE LAST PAGE

Core-Periphery Relations

BY BARBARA BECKWITH

MY SON IS IN LOVE AND ENGAGED to be married. Trouble is, he wants the two families to fall in love as well. He's proposing a five-day camping trip so we can bond "au naturel." In Yiddish, there's a word, *machetunim* (mah-kha-TOO-nim), that encompasses the familial relationship between the two sets of parents. In English, there's no such word. "It's a marriage, not a merger," I argue, suggesting that we meet his fiancée's family at a restaurant. We compromise on a long weekend at our cottage in Pennsylvania.

Before the rendezvous, my future daughter-in-law takes out her photograph album to prep me. The parents have split but stayed buddies. One snapshot shows her father hamming it up with his second wife and their two kids, alongside his first wife and her mate. I worry: Will we, who rarely ham it up, look like fuddy-duddies?

I wonder what her parents want to know about us. Will we argue about politics? Should we reveal that hay fever runs in our family?

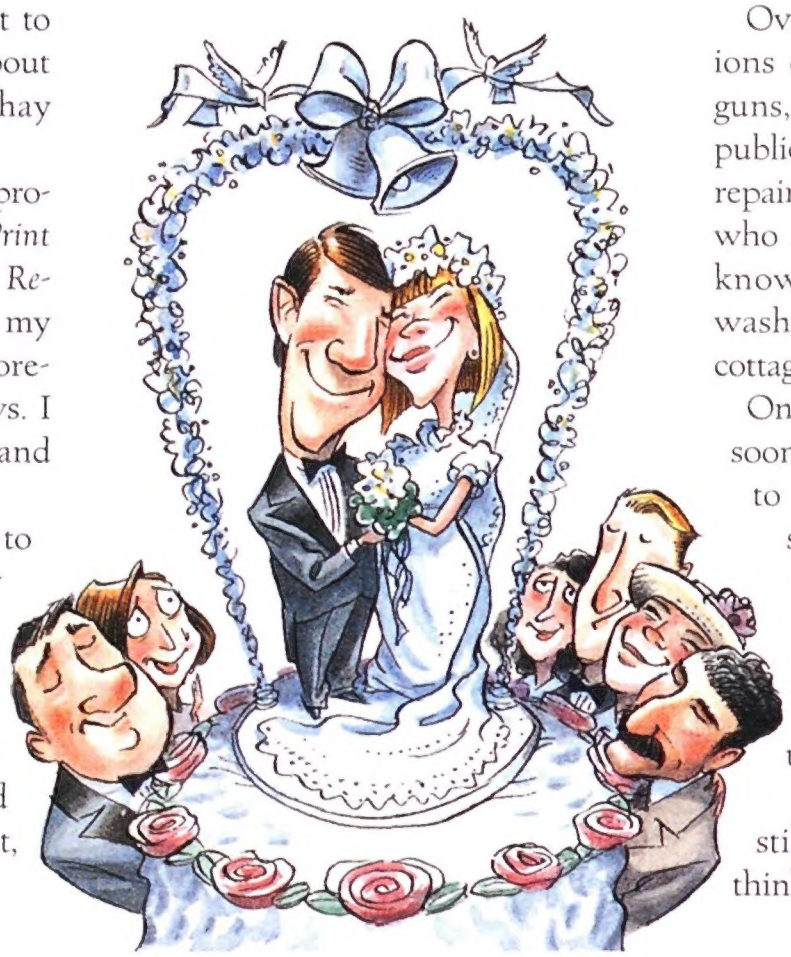
I know the father is a university professor. I find his name in *Books in Print* next to titles such as *Core-Periphery Relations in Precapitalist Worlds*. I ask my friends in academia, "What are core-periphery relations?" No one knows. I consider skipping the gathering and simply exchanging curricula vitae.

A few weeks later, we pull up to the cottage just as the other family arrives in their van. They emerge carrying casseroles, snacks and desserts. The father wears a backpack atop which sits a folding potty. The last passenger bounds toward me—a large poodle who, it turns out, pees on people he does not know.

The other family has brought a camcorder to document every moment, so I gesture like Oprah and ham it up a bit to head off any impression of fuddy-duddiness. At lunch, we exchange lively repartee, but after another hour I'm exhausted and retreat to my room to rest and read. I soon realize, however, that the novels I've brought with me are about dysfunctional families. Chagrined, I return to the living room, intent on proving myself a functioning family member.

The first day appears to be a success. Still, every moment vibrates with significance. The sense of an agenda persists, like humidity weighing down the air.

Should we reveal that hay fever runs in our family?



The next day, I note with approval that the other father is happy when his daughters catch fish while he, the expert, gets not a nibble. My son's future wife also impresses me. When we emerge from a stream, covered with leeches, she—a wetlands researcher—calmly picks them off us, one by one.

Later, we go to a lake. While my son and his loved one do tai chi on the grassy shore, I swim out to the raft. The other father follows me and we drop to the hot planks. "So, should they get married?" he suddenly asks. I shrug. "It's not up to us, is it?" I say.

But he, like my husband, believes in the concern-equals-love school of parenting. He requires my opinion. I sit upright and we discuss the matter, seriously and at length. We conclude that, yes, our children are right for each other and, yes, they should marry.

Over the weekend, we swap opinions on subjects ranging from handguns, ecology and Muslim history to public schools, the Internet and gutter repair. We also jockey for status as to who leads the simplest life. I let it be known that we don't own a dishwasher. They top me: their country cottage has no toilet, only an outhouse.

On our last night at the cottage, our soon-to-be-wed children take us out to lie on the grass and look at the stars. They then lead us inside, put on a tape and get everybody to dance. My son and his fiancée dance fast, slow down and then embrace. The rest of us—we machetunim—cheer.

As for core-periphery relations, I still can't define the phrase, but I think I've just experienced one.

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Me and the
boys at the lake
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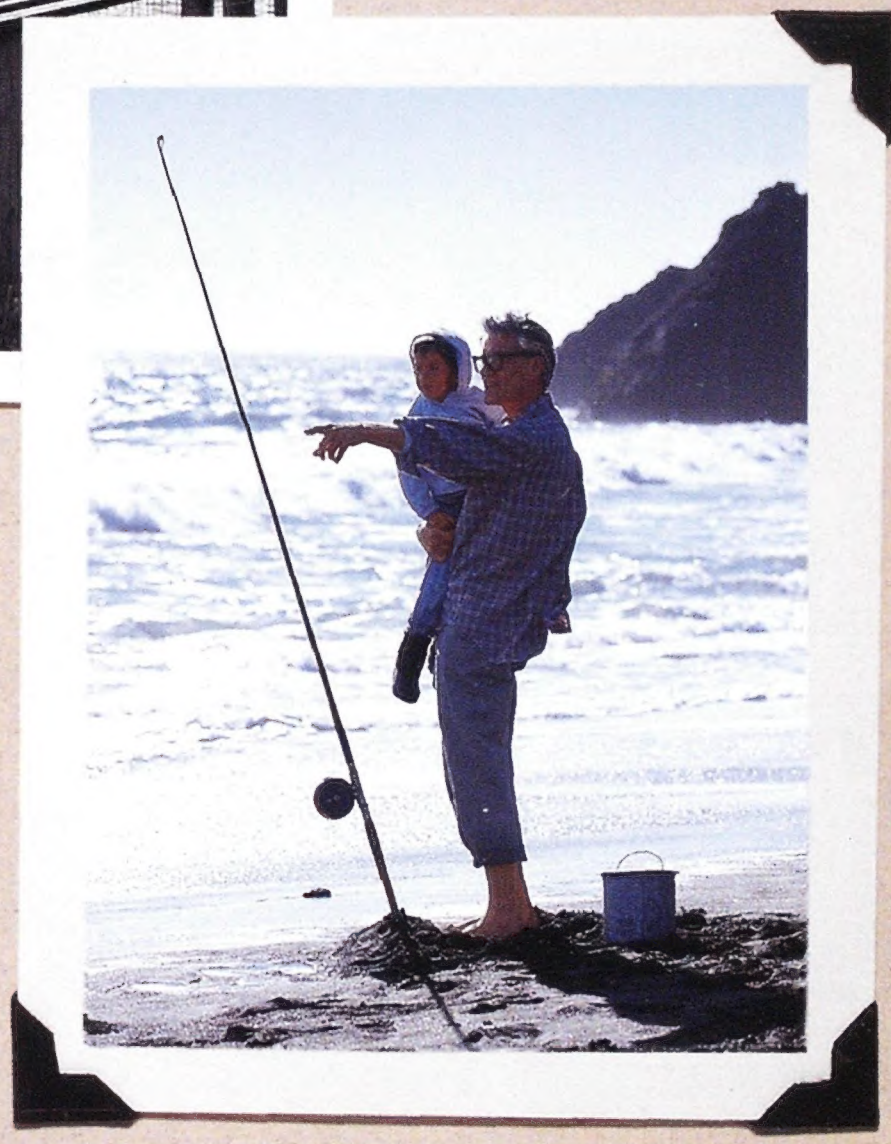

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